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Dräger Medical, Inc.

Dräger

Operator's Instruction Manual

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Integrated Patient Monitor Option for the Narkomed 6000 Anesthesia Machine

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1 Introduction

This section introduces you to the Integrated Patient Monitor Option Operator's Manual and provides important safety information.

Operator's Responsibility for Patient Safety

Draeger Medical anesthesia products are designed to provide the greatest degree of patient safety that is practically and technologically feasible. The design of the equipment, the accompanying literature, and the labeling on the equipment take into consideration that the purchase and use of the equipment are restricted to trained professionals, and that certain inherent characteristics of the equipment are known to the trained operator. Instructions, warnings, and caution statements are limited, therefore, to the specifics of the Draeger Medical design. This publication excludes references to hazards that are obvious to a medical professional, to the consequences of product misuse, and to potentially adverse effects in patients with abnormal conditions. Product modification or misuse can be dangerous. Draeger Medical disclaims all liability for the consequences of product alterations or modifications, as well as for the consequences that might result from the combination of Draeger Medical products with products supplied by other manufacturers if such a combination is not endorsed by Draeger Medical.

The operator of the anesthesia system must recognize that the means of monitoring and discovering hazardous conditions are specific to the composition of the system and the various components of the system. It is the operator, and not the various manufacturers or suppliers of components, who has control over the final composition and arrangement of the anesthesia system used in the clinical practice. Therefore, the responsibility for choosing the appropriate safety monitoring devices rests with the operator and user of the equipment.

Patient safety may be achieved through a variety of different means depending on the institutional procedures, the preference of the operator, and the application of the system. These means range from electronic surveillance of equipment performance and patient condition to simple, direct contact between operator and patient (direct observation of clinical signs). The responsibility for the selection of the best level of patient monitoring belongs solely to the equipment operator. To this extent, the manufacturer, Draeger Medical, disclaims responsibility for the adequacy of the monitoring package selected for use with the anesthesia system. However, Draeger Medical is available for consultation to discuss monitoring options for different applications.

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Furthermore, buyer acknowledges that the consideration for the products, equipment, and parts sold reflects the allocation of risk and the limitations of liability referenced herein.

Restriction

Federal law restricts this device to sale by, or on the order of, a physician.

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Disclaimer

The content of this manual is furnished for informational use only and is subject to change without notice. Draeger Medical, Inc. assumes no responsibility or liability for any errors or inaccuracies that may appear in this manual.

Recommendations

In the interest of patient safety, Draeger Medical strongly advocates the use of an oxygen analyzer, pressure monitor, a volume monitor, and an end-tidal CO_2 monitor in the breathing circuit at all times.

Because of the sophisticated nature of Draeger Medical anesthesia equipment and its critical importance in the clinical setting, it is highly recommended that only appropriately trained and experienced professionals be permitted to service and maintain this equipment. Please contact DrägerService at (800) 543-5047 for service of this equipment.

Draeger Medical also recommends that its anesthesia equipment be serviced at three-month intervals. Periodic Manufacturer's Service Agreements are available for equipment manufactured by Draeger Medical. For further information concerning these agreements, contact DrägerService at (800) 543-5047.

Symbol Definition

The following symbols appear on the Integrated Patient Monitor:

CAUTION: Refer to accompanying documents before operating equipment.

Defibrillator-proof type BF equipment. Type BF equipment is suitable for intentional external and internal application to the patient, excluding direct cardiac application. Type BF equipment is type B equipment with an F-type isolated (floating) part. The paddles indicate the equipment is defibrillator-proof.

Defibrillator-proof type CF equipment. Type CF equipment is specifically designed for applications where a conductive connection directly to the heart is established. The paddles indicate the equipment is defibrillator-proof.

How This Manual Is Organized

All users of the Integrated Patient Monitor must read this manual completely before using the equipment. This manual is intended to be used in conjuction with the *Narkomed 6000 Anesthesia System Operator's Instruction Manual*.

To make this document more convenient for future reference, it is divided into several independent sections.

Section 2 - "General Description" provides a summary of Integrated Patient Monitor features and functions.

Section 3 - “ECG Monitoring/Segment Analysis” contains detailed configuration and operational information specific to ECG monitoring and ST segment analysis.

Section 4 - “IBP Monitoring” contains detailed configuration and operational information specific to IBP monitoring.

Sections 5 - “Cardiac Output Monitoring” contains detailed configuration and operational information specific to cardiac output monitoring.

Section 6 - “Temperature Monitoring” contains detailed configuration and operational information specific to Temperature Monitoring.

Section 7 - “NIBP Monitoring” contains detailed configuration and operational information specific to NIBP Monitoring.

Section 8 - “SpO_2 Monitoring” contains detailed configuration and operational information specific to SpO_2 Monitoring.

Section 9 - “Specifications” lists the specifications for all system components.

Appendix 1 contains a list of spare and replacement parts.

Appendix 2 contains template tables which list the settings that can be stored in templates.

Conventions Used in This Manual

This manual has several conventions to help organize the information presented. Please read about these conventions carefully to understand their significance in the manual.

Typefaces

Different typefaces are used throughout the manual to differentiate between narrative information and machine messages and labels.

Warnings and Cautions

All parts of this manual contain warning and caution statements about the Integrated Patient Monitor.

- *Warning* statements give important information that, if ignored, could lead directly to a patient's or operator's injury.
- *Caution* statements give important information that, if ignored, could lead directly to equipment damage and, indirectly, to a patient's injury.

General Safety Information

The Integrated Patient Monitor is protected against the effect of cardiac defibrillator discharge to ensure proper recovery, as required by test standards. (The screen may blank during a defibrillator discharge but recovers within seconds as required by test standards.)

The Integrated Patient Monitor is not likely to cause abnormal operation of other patient-connected equipment such as a cardiac pacemaker or other electrical stimulators.

Periodically, and whenever the integrity of the Integrated Patient Monitor is in doubt, connect a patient simulator and test all functions.

General Warnings and Cautions

The following list of warnings and cautions apply to general operation and maintenance of the Integrated Patient Monitor. Warnings and cautions about installing and operating specific parts appear with those topics.

WARNING: Any person involved with the setup, operation, or maintenance of the Integrated Patient Monitor must be thoroughly familiar with this instruction manual. However, instructions in this manual in no way supersede established medical procedures for patient care.

WARNING: The Integrated Patient Monitor is designed to be operated under the constant surveillance of a qualified operator.

WARNING: Connecting to auxiliary output - to remain within risk current limits, connect only to devices tested and certified for use in patient environment.

WARNING: The Integrated Patient Monitor must not be used in the presence of flammable anesthetics.

WARNING: Repair of the Integrated Patient Monitor must only be performed by an authorized representative of DrägerService®.

WARNING: A test for leakage current must be performed by qualified biomedical engineering personnel before use if the Integrated Patient Monitor is interfaced with other equipment.

WARNING: To avoid electrical shock hazard:

- Due to the risk of electric shock, do not remove any component cover. Refer any servicing to an authorized representative of DrägerService.
- Use only hospital-grade grounded electrical outlets and power cord.

- Make sure the external equipment is hospital-grade grounded before connecting the equipment.
- Disconnect the power supply of the Narkomed 6000 from the electrical outlet before cleaning. Let it dry completely before reconnecting it to the electrical outlet.

WARNING: To ensure patient safety:

- This device should be used by, or on the order of, a physician.
- Constant attention by a qualified professional is needed whenever a patient is under anesthesia or connected to a ventilator. Some equipment malfunctions may pass unnoticed in spite of the monitor alarm.
- Always make sure that alarm limits are set and alarms are active when monitoring a patient. Do not rely exclusively on the audible alarm system for patient monitoring. Adjusting the alarm volume to a low level during patient monitoring can jeopardize the patient.
- Keep pacemaker patients under close surveillance. Rate meters may continue to count pacemaker rate during incidents of cardiac arrest or some arrhythmias. Do not rely solely on rate meter alarms.
- Use only protected lead wires and patient cables with the Integrated Patient Monitor. Using unprotected lead wires and patient cables creates the potential for making an electrical connection to a high voltage power source that can cause serious injury or death to the patient.
- Make sure the return electrode of the electrosurgery unit is properly connected to the patient to avoid possible burns at ECG electrode or other probe sites. Avoid making any conductive connection to the patient that is likely to affect the patient's safety.
- Use only patient cables and accessories approved by Draeger Medical. Other cables and accessories may not provide defibrillation protection, protection against high frequency burns, or can damage the system and interfere with measurement.
- Do not come into contact with the Integrated Patient Monitor or patient cables while a patient is being defibrillated. Serious injury or death could result.
- Proper placement of defibrillator paddles in relation to the electrodes is required to minimize harm to the patient.

- Route all cables away from the patient's throat to avoid possible strangulation.
- Exercise extreme care when applying medical electrical equipment. Many parts of the man/machine circuit are conductive, such as the patient, connectors, electrodes, and transducers. Ensure that these conductive parts, when connected to the isolated patient input of the device, do not come into contact with other grounded, conductive parts. Such contact would bridge the patient's isolation and cancel the protection provided by the isolated input.
- All invasive procedures involve patient risk. Use aseptic technique. Follow catheter manufacturer's instructions.
- Do not perform cardiac output measurement during electrosurgery. Incorrect readings can result.
- If the accuracy of any value display is in doubt, first determine the patient's vital signs by alternate means before verifying that the Integrated Patient Monitor is working correctly.
- If the display loses patient data, it is possible that active monitoring is not being performed. Close patient observation or alternate monitoring devices should be used until monitor function is restored.

WARNING: If fluids are accidentally spilled on the Integrated Patient Monitor, take the Narkomed 6000 temporarily out of service by putting the machine in monitor standby mode and unplugging the main power cord from the AC outlet. Refer to "Powering Down the Narkomed 6000 for Cleaning" in the "General Care and Maintenance" section of the *Narkomed 6000 Operator's Instruction Manual*.

CAUTION: When moving equipment connected to the Integrated Patient Monitor, disconnect the connection to the Integrated Patient Monitor and move the equipment separately.

CAUTION: Although designed to minimize the effects of ambient radio-frequency interference, the Integrated Patient Monitor may be adversely affected by the operation of electrosurgical equipment or shortwave or microwave diathermy equipment in the vicinity. To prevent ESU overload, use the leads and cables specified in "Spare and Replacement Parts" in the Appendix in the back of this manual.

CAUTION: Patient signal inputs labeled with the CF and BF symbols with paddles are protected against damage resulting from defibrillation and electrocautery voltages.

CAUTION: Proper placement of defibrillator paddles in relation to the electrodes is required to minimize harm to the patient.

CAUTION: Disposable devices are intended for single use only. They should not be reused as performance could degrade or contamination could occur.

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2 General Description

This section describes Integrated Patient Monitor Option features and general functionality.

Integrated Patient Monitor (IPM) Option Overview

The IPM is a measurement module built into the side of the Narkomed 6000. It sends real-time patient measurement data to the Narkomed 6000 which integrates all the monitoring information and alarms for display on its main screen.

The IPM Option provides the following patient monitoring functions:

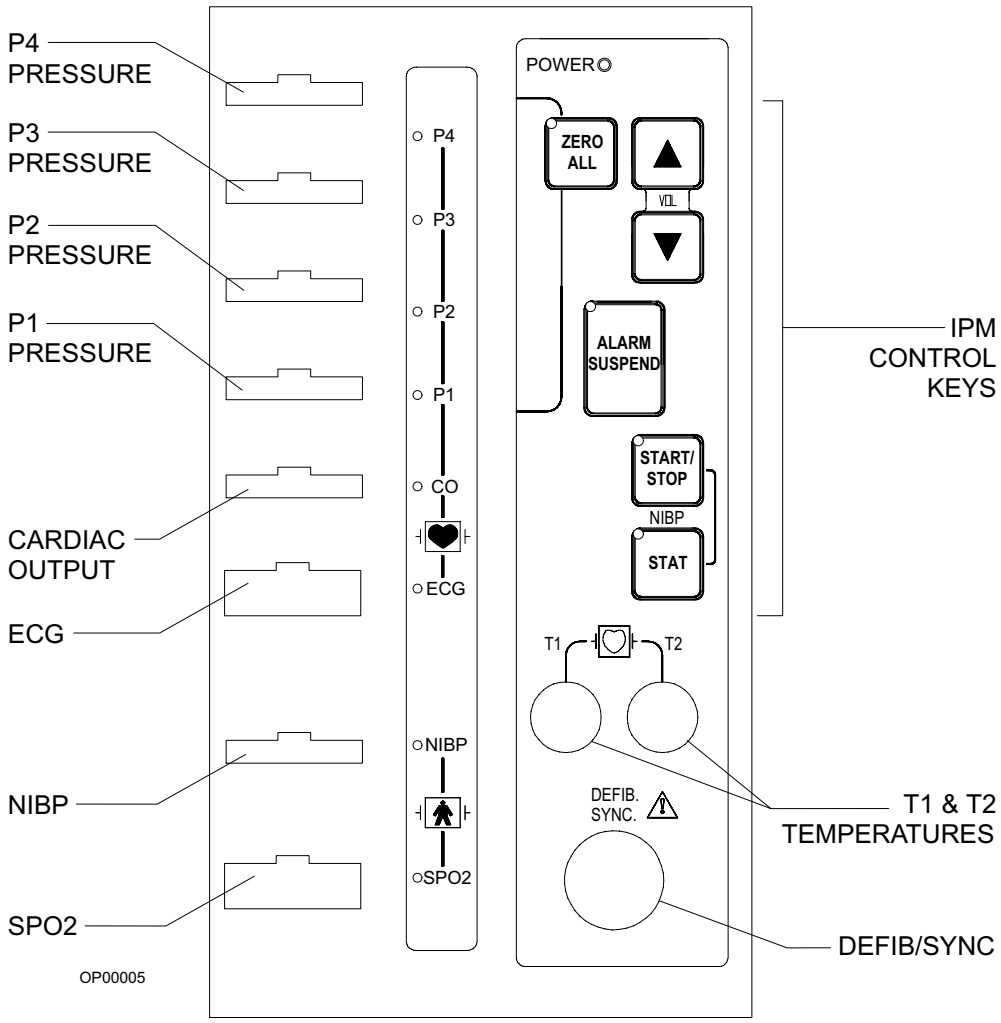
- seven-lead ECG with ST segment analysis
- four invasive blood pressure channels
- thermodilution cardiac output
- two temperature channels
- one noninvasive blood pressure (NIBP) channel
- one pulse oximetry (SpO_2) channel

IPM Interface Panel

The IPM interface panel contains connectors, control keys, and indicator lights for the various monitoring functions. All control key functions except **[ZERO ALL]** can also be accessed via the main touch screen.

The interface panel is shown in Figure 2-1.

Figure 2-1. IPM Interface Panel



IPM Control Keys

The functions of the control keys on the IPM interface panel are as follows:

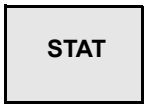
The **[ZERO ALL]** key zeroes all invasive pressure channels simultaneously.

The **[VOL]** key increases or decreases the volume of the pulse tone.

The **[ALARM SUSPEND]** key stops the system from displaying and sounding patient alarms. It provides the same function as the **[ALARM SUSPEND]** control button on the Narkomed 6000 screen.

The **[START/STOP]** key is for NIBP operation:

- If NIBP operation is suspended, pressing this key starts an NIBP measurement and will continue to take measurements at a preset time interval (Auto Mode)
- If NIBP is started, pressing this key stops measurement, and further NIBP operation is suspended.



Pressing the **[STAT]** key begins the process of taking successive NIBP samples continuously for five minutes. After five minutes, samples are taken in the time interval set in the NIBP notebook.

Monitoring Information

Patient information obtained from the IPM is displayed in the same numerical and graphical format as the other Narkomed 6000 information.

This manual provides information specific to monitoring functions provided by the IPM. For information on all other Narkomed 6000 monitoring functions as well as complete information on screen displays and the use of the Narkomed 6000 touch screen, see the *Narkomed 6000 Anesthesia System Operator's Instruction Manual*.

Display Colors

Colors in the displays are not configurable by the clinician. Consistent colors have been programmed to appear on labels, numeric values, waveforms, and trends for a given parameter. The colors for the parameters monitored by the IPM are shown in Table 2-1.

Table 2-1. Display Colors for IPM Parameters

Parameter	Color
ECG	green
ST Segment	white
IBP channel 1	red
IBP channel 2	blue
IBP channel 3	yellow
IBP channel 4	red
Cardiac Output	red
Temperature	white
NIBP	white
SpO2	blue

Screen Configuration

When the Narkomed 6000 is configured with an IPM, the screen configuration, which includes the number of waveforms and location of parameter boxes, is determined by the availability of data for each parameter (i.e., measurement cable connected or not connected). The screen display is reconfigured automatically, without input from the clinician.

The five-waveform screen is the standard Narkomed 6000 screen display without any monitoring information from the IPM. On machines with an installed IPM, the number of waveforms and vertical parameter boxes will vary from five to eight, depending on available parameters. In addition, up to seven horizontal parameter boxes can be displayed along the bottom of the waveform area. The location of parameter boxes can vary, and if data is

unavailable, the contents of some boxes may be blank or the boxes may be removed from the screen altogether.

Note: Note the following with six, seven, and eight-waveform screen configurations:

- the size of the numerics in the parameter boxes *decreases* when the alarm limits are displayed and *increases* when alarm limits are *not* displayed.
- the label for the breathing pressure parameter box is Paw (instead of Pressure in the five-waveform screen)

See Figure 2-2 and Figure 2-3 for examples of two possible screen configurations:

Figure 2-2. Screen Display with IPM Information (least possible number of waveforms and parameter boxes)

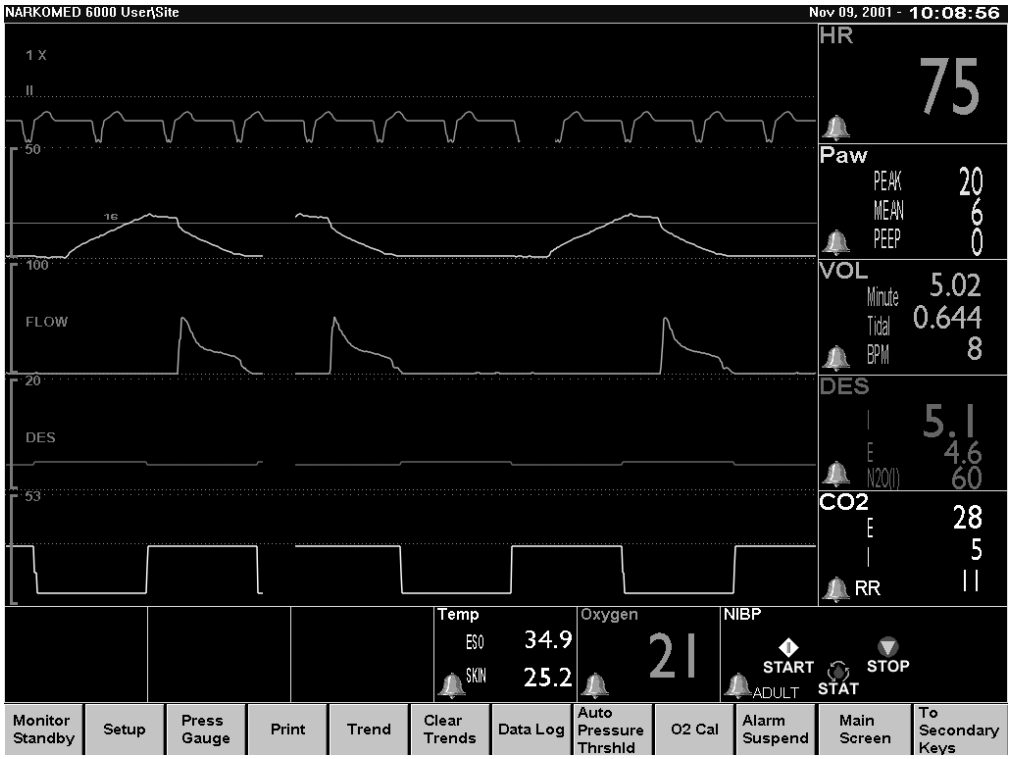
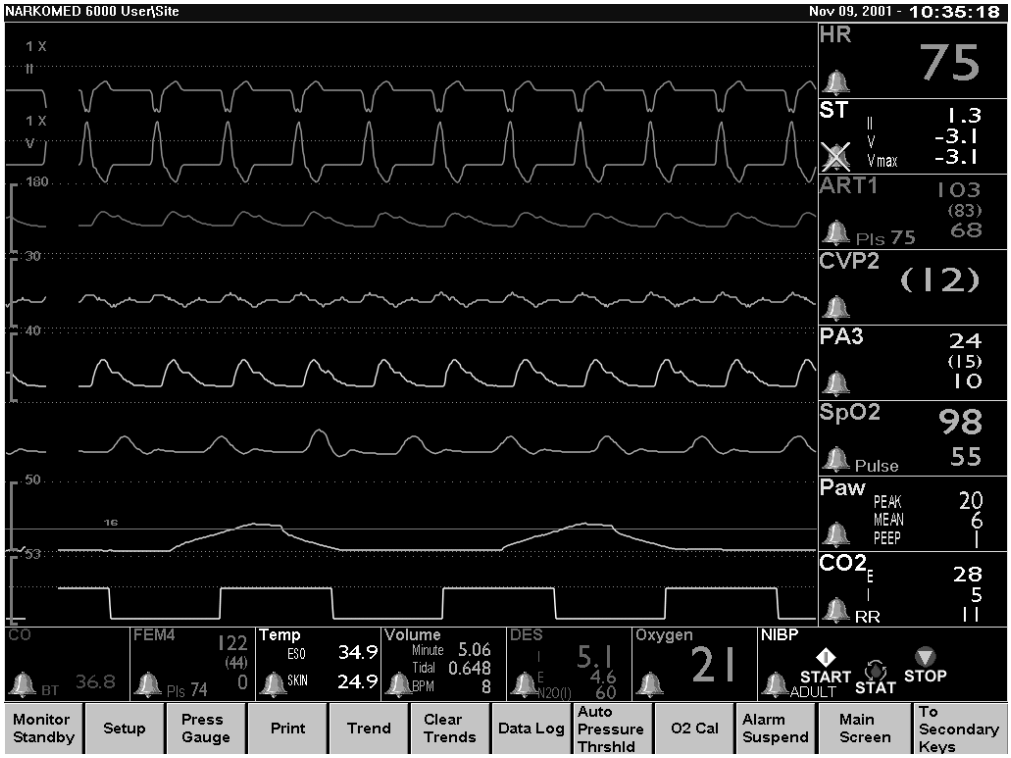


Figure 2-3. Screen Display with IPM Information (greatest possible number of waveforms and parameter boxes)



Configuring the Screen Display

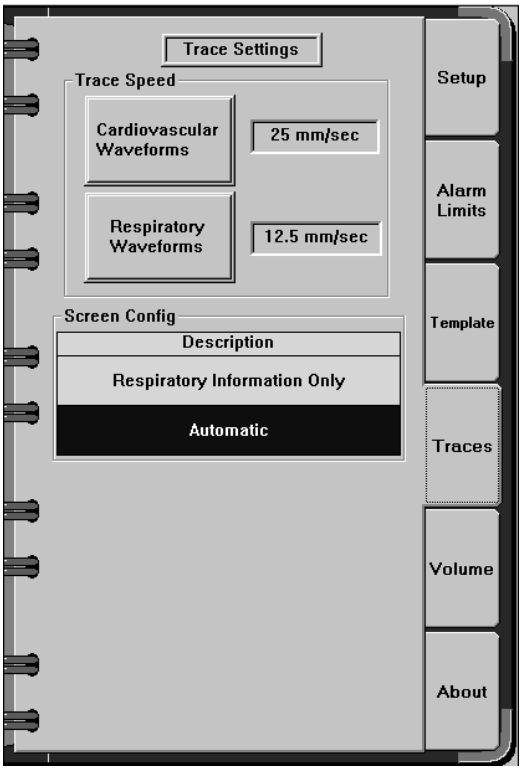
The clinician can choose to display only respiratory information (no IPM data) or to allow the display of IPM data configured automatically by the Narkomed 6000.

The screen display as well as the trace speed are set in the traces page of the system setup notebook.

To display the traces page:

1. Touch the **[Setup]** button in the main screen taskbar to display the system setup notebook.
2. Touch the **[Traces]** tab to view the traces page.

Figure 2-4. System Setup Traces Page



Cardio-vascular Waveforms

This option allows the clinician to select the trace speed of the cardiovascular waveforms. Touching **[Cardiovascular Waveforms]** or its associated selection field toggles the trace speed between 25 mm/sec and 50 mm/sec.

Trace speed for all other waveforms is selected using the **[Respiratory Waveforms]** button.

Selecting the Screen Configuration

The screen configuration options are shown in the bottom half of the traces page under the heading Screen Config (see Figure 2-4).

To select the screen configuration:

- Touch **[Respiratory Information]** to display the standard Narkomed 6000 screen with no IPM-related information.
- Touch **[Automatic]** to display all available parameters. The screen is updated to include available IPM-related information as well as all standard respiratory information.

Note: Screen configuration changes are not allowed while a cardiac output or an NIBP measurement is in progress.

Following the screen configuration change, most user settings will remain unchanged. Alarms active prior to the screen configuration change will remain active, with the exception that all IPM-related alarms will be suppressed when the screen configuration is changed to the Respiratory Information Only display.

Locking Position of Agent and Volume Parameter Boxes

The positions of parameter boxes on the screen are normally determined automatically by the Narkomed 6000. However, controls are provided for the clinician to lock the position of the agent and volume parameter boxes in a horizontal orientation.

Note: Locking the position of the agent or volume parameter box will not be allowed if doing so would result in a screen configuration of fewer than five waveforms.

To lock the agent and/or volume parameter box in a horizontal position:

1. Touch the agent or volume parameter box anywhere except the alarm bell to display the parameter notebook.
2. Touch the **[Setup]** tab to display the setup page. See Figure 2-5 and Figure 2-6.
3. Touch **[Numbox Location]** or its associated selection field until the preferred setting is displayed.
   - **Horizontal** - locks the parameter box in a horizontal position
   - **Auto** - allows the position of the parameter box to be determined by the Narkomed 6000

Figure 2-5. Setup Page in Agent Parameter Notebook

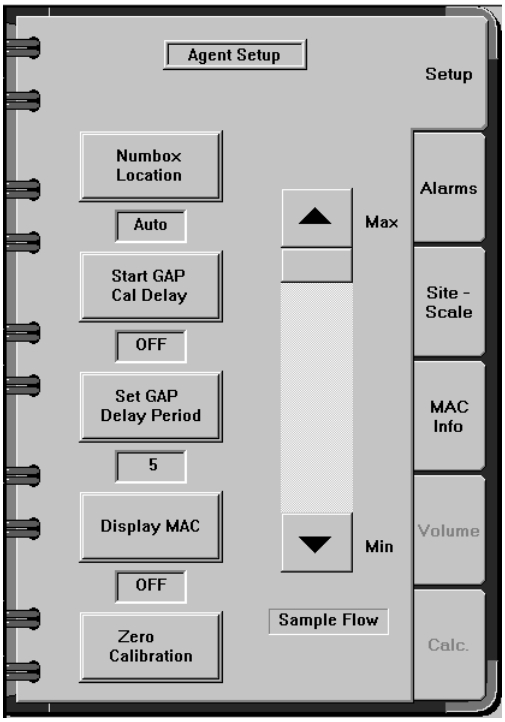
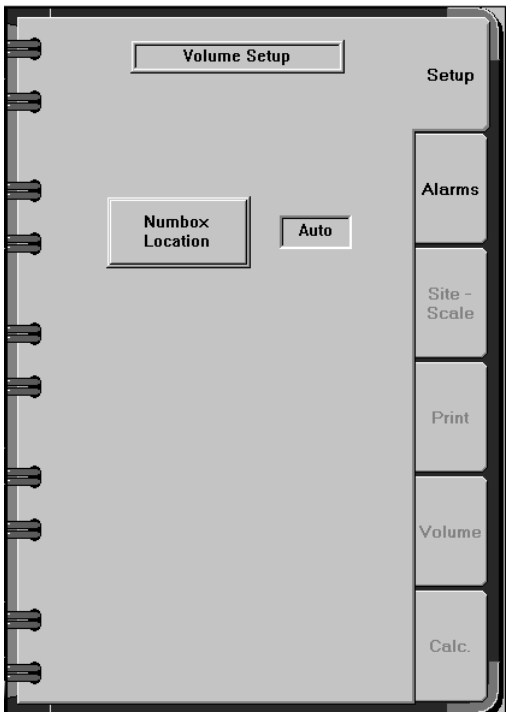


Figure 2-6. Setup Page in Volume Parameter Notebook



Trends

The trend display contains data for those parameters that are displayed in the current screen configuration and for which data is currently available. Up to four pages of trend data can be displayed. Table 2-2 shows the specific parameters displayed on each trend page (if available), along with corresponding colors and scale limits.

To display the trends:

1. Touch the **[Trend]** button in the main screen taskbar.
2. Touch the displayed trend window to bring up the trend dialog box.
3. Touch the **[Next]** or **[Previous]** button in the dialog box to view other trend pages.

For complete information on trends, see the *Narkomed 6000 Anesthesia System Operator's Instruction Manual*.

Table 2-2. Trend Display with IPM Parameters

Parameter	Color	Scale min/max displayed in trend
Page 1		
Heart Rate	Green	0/200 bpm
ST (if available)	White	-12/12 mm*
IBP Channel 1 (if available)	Red	0/200 mm Hg
IBP Channel 2 (if available)	Blue	0/200 mm Hg
IBP Channel 3 (if available)	Yellow	0/200 mm Hg
IBP Channel4 (if available & parameter box is vertical)	Red	0/200 mm Hg
SPO_2 (if available)	Blue	85/100%
Breathing Pressure	Yellow	-10/100 cm H_2O
Minute Volume (if parameter box is vertical)	Blue	0.0/50.0 L
Agent (if parameter box is vertical)	Peach	0/9.0%,except Desflurane 0/20.0%
CO_2	White	0.0/10.0%, 0.0/10.0 kPa, 0/76 mm Hg
Page 2		
Minute Volume (if parameter box is horizontal)	Blue	0.0/50.0 L
Agent (if parameter box is horizontal)	Peach	0/9.0%,except Desflurane 0/20.0%
O_2	Green	0/100%
Lung Compliance	White	0.0/150.0 mL/cm H_2O
Page 3		
ST I (if available)	White	-12/12 mm*
ST II (if available)	White	-12/12 mm*
ST III (if available)	White	-12/12 mm*

Parameter	Color	Scale min/max displayed in trend
ST V (if available)	White	-12/12 mm*
ST aVR (if available & if there are 7 or 8 trends per page)	White	-12/12 mm*
ST aVL (if available & if there are 7 or 8 trends per page)	White	-12/12 mm*
ST aVF (if available & if there are 7 or 8 trends per page)	White	-12/12 mm*
Page 4 (if required)		
ST aVR (if available & if there are 5 or 6 trends per page)	White	-12/12 mm*
ST aVL (if available & if there are 5 or 6 trends per page)	White	-12/12 mm*
ST aVF (if available & if there are 5 or 6 trends per page)	White	-12/12 mm*
IBP Channel4 (if available & parameter box is horizontal))	Red	0/200 mm Hg
Temperature	White	20.0/45.0°C
Blood Temperature (if available)	Red	20.0/45.0°C

*autoscales over ±2.0, ±4.0, ±12.0 mm

Data Log

The data log contains data for those parameters that are displayed in the current screen configuration and for which data is currently available. Data is recorded in intervals selected by the user. Table 2-3 below shows the order of the entries displayed in the log (if available). For complete information on the data log, see the *Narkomed 6000 Anesthesia System Operator's Instruction Manual*.

Data Log Control

To customize the data log display, touch any part of the data log currently displayed on the screen. The Data Log Control dialog box appears:

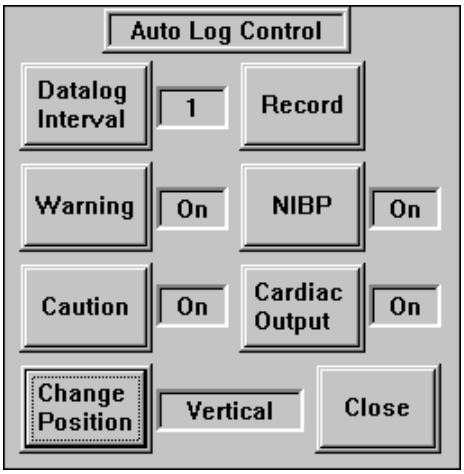


Figure 2-7. Data Log Control Dialog Box

The **[NIBP]** and **[Cardiac Output]** control buttons are available only when the Narkomed 6000 is configured with an IPM. Their functions are described below. The functions of the remaining control buttons are described in the *Narkomed 6000 Anesthesia System Operator's Instruction Manual*.

NIBP

This control button determines when new NIBP data is entered into the data log.

Touch **[NIBP]** or its associated selection field until the preferred setting is displayed:

- On - new NIBP data appears in the data log when the measurement completes
- Off - new NIBP data appears in the data log at the next data log interval

Cardiac Output

This control button determines when new cardiac output data is entered into the data log.

Touch **[Cardiac Output]** or its associated selection field until the preferred setting is displayed:

- On - new cardiac output data appears in the data log when the measurement completes
- Off - new cardiac output data appears in the data log at the next data log interval

Table 2-3. Data Log Entries

Data Log with IPM Parameters	
Data Log Entry	**Monitoring Measure**
Time	time readings were taken
NIBP S/D	NIBP systolic/diastolic pressure (mm Hg)
NIBP Mean	NIBP mean pressure (mm Hg)
HR	Heart rate (bpm)
SPO2	oxygen saturation (%)
SPO2 Pulse	SpO_2 pulse (bpm)
ET CO2	End tidal carbon dioxide concentration readings in the currently selected units.
Resp Rate	respiratory rate (BPM) (from flow sensor)
P1 S/D	Systolic/diastolic pressure from channel P1 (mm Hg)
P1 Mean	Mean pressure from channel P1 (mm Hg) (site shown)
P2 S/D	Systolic/diastolic pressure from channel P2 (mm Hg)
P2 Mean	Mean pressure from channel P2 (mm Hg) (site shown)
P3 S/D	Systolic/diastolic pressure from channel P3 (mm Hg)
P3 Mean	Mean pressure from channel P3 (mm Hg) (site shown)
P4 S/D	Systolic/diastolic pressure from channel P4 (mm Hg)
P4 Mean	Mean pressure from channel P4 (mm Hg) (site shown)
Agt I/E	agent inspiratory and expiratory concentration (percent) readings
Tid Vol	tidal volume (liters)
Min Vol	minute volume (liters)

Data Log with IPM Parameters	
Data Log Entry	**Monitoring Measure**
Peak Pres	peak pressure (cmH_2O)
Plat Pres	plateau pressure (cmH_2O)
Mean Pres	mean pressure (cmH_2O)
PEEP	PEEP (cmH_2O)
O2	oxygen concentration (percent) readings
ST CH1	ST value from Channel 1
ST CH2	ST value from Channel 2
ST MAX	Maximum ST value
Temp 1	T1 temperature (°C or °F)
Temp 2	T2 temperature (°C or °F)
CO	cardiac output (L/min)
Blood Temp	blood temperature (°C)

Printing SpO_2/NIBP Data Log

When the Narkomed 6000 is configured with an IPM, the clinician can selectively print only NIBP and SpO_2 information.

1. Press **[Print]** on the main screen taskbar. The options page appears.

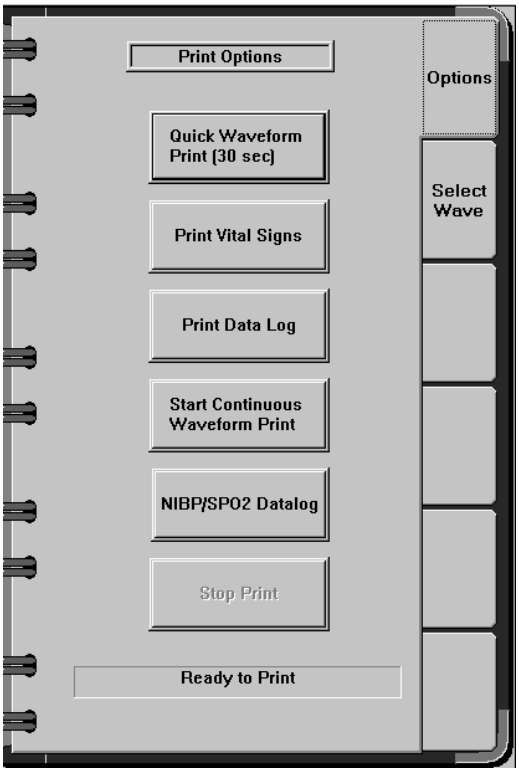


Figure 2-8. Print Options Page in Print Notebook

2. Touch **[NIBP/SPO2 Datalog]** to initiate the printing of NIBP and SPO2 data. While the print is taking place, the message "NIBP/SPO2 Data Log Print in Progress" appears at the bottom of the options page. All other control buttons on the options page are disabled until the print is completed, with the exception of the **[Stop Print]** button.

   The most recent data is located at the bottom of the printout. If monitoring information for a particular parameter is invalid or not available, dashes appear for that parameter on the printed data log. See Figure 2-9.

   For complete information on printing data using the Strip Chart Recorder, see the *Narkomed 6000 Anesthesia System Operator's Instruction Manual*.

OP00651

PATIENT:_____
_____
DATE: 11/13/01
TIME: 11:42:29

Time H:M	SYS	DIA	MBP	HR BPM	SA %
	---mmHg----				
1102	---	---	---	55	98
1104	---	---	---	55	98
1105	121	73	91	55	98
1106	---	---	---	55	98
1108	---	---	---	55	98
1109	121	73	91	55	98
1110	---	---	---	55	98
1112	---	---	---	55	98
1113	120	73	91	55	98
1114	---	---	---	55	98
1116	---	---	---	55	98
1117	120	73	91	55	98
1118	---	---	---	55	98
1120	---	---	---	55	98
1121	121	73	91	55	98
1122	---	---	---	55	98

Figure 2-9. Example of an NIBP/SPO2 Data Log Report

Templates

If the Templates and Sounds option is installed on the Narkomed 6000, the clinician may choose a set of preconfigured system settings from a library of previously configured templates. See Appendix 2 for a list of settings that can be stored in a template as well as the default factory values for those settings. Template operations are fully described in the *Narkomed 6000 Anesthesia System Operator's Instruction Manual.*

Alarms

The following are general alarms that can occur with the IPM. Alarms specific to particular monitoring functions appear in the corresponding chapters later in this manual.

Table 2-4. System Advisories

Message	Condition	Suggested Action
CVP COMM LOST	IPM module communications failure	Contact an authorized representative of DrägerService.
CVP FAN FAIL	Fan failure within IPM module	Contact an authorized representative of DrägerService.

3

ECG Monitoring/ST Segment Analysis

This section contains configuration and operational information specific to ECG monitoring and ST Segment analysis.

Overview

The Narkomed 6000 with the Integrated Patient Monitor option can monitor ECG and perform ST segment analysis.

It provides full ECG monitoring of up to seven leads with simultaneous display of numeric and waveform data from up to two leads. The system acquires signal data from a 5-leadwire or a 3-leadwire cable set.

Table 3-1. 3 and 5-Leadwire Cable Monitoring

Cable	Number of Leads Monitored	Number of ECG Waveforms Displayed
3-leadwire set	3 leads	1 waveform
5-leadwire set	7 leads	2 waveforms

The heart rate is detected and displayed. A QRS pulse tone is available for audio monitoring. A pace pulse option can be set to detect pacemaker pulses, remove them from the heart rate calculation, and display them in the waveform.

The system is compatible with defibrillators and intra-aortic balloon pumps. The system displays the point where the defibrillator synchronized pulse occurs in the ECG waveform.

The system can identify and display lead fault errors. When the heart rate alarms are turned on, the system also alerts the operator to heart rate violations.

ST segment analysis information is performed on all leads and displayed in the ST parameter box. The ST numeric values show the ST deviation for the lead selected for channel 1, for the lead selected for channel 2, and for the lead with the maximum ST value.

ECG Display

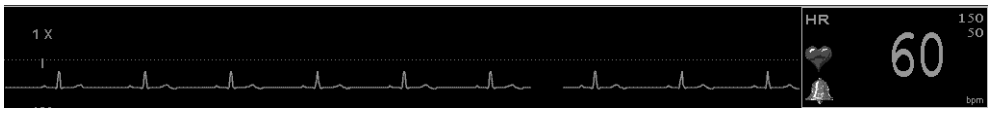
The ECG parameter box is labeled HR. The current heart rate is displayed numerically and also visually with a flashing heart icon that “beats” with each pulse. The numeric display range is 0 to 300 beats per minute (bpm) and the value is updated every two seconds.

Up to two simultaneous ECG waveforms are displayed as the two top-most waveforms (two waveforms when either a 5-leadwire set or no leadwire set is connected, and one waveform when a 3-leadwire set is connected). The color of the waveforms is the same as the color of the ECG numeric data.

Lead labels are shown on the left side of the waveform. The lead can be changed by touching the lead label until the desired lead is displayed. The lead can also be changed in the Setup page of the ECG notebook.

The scale factor for the ECG waveform is also shown on the left side of the waveform. The scale factor can only be changed in the setup page of the ECG notebook (it is not touch sensitive).

Figure 3-1. ECG Parameter Box and Waveform

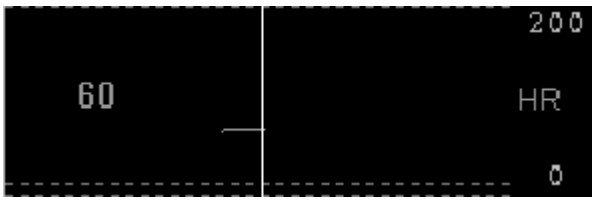


ECG Trend

The heart rate trend is represented as a single line. The low scale value is 0 bpm and the high scale value is 200 bpm.

Trends are displayed by touching the **[Trend]** button in the main screen taskbar. For complete information on trends, see the Narkomed 6000 Operator's Instruction Manual.

Figure 3-2. ECG (Heart Rate) Trend



ST Segment Analysis Display

The ST segment parameter box is labeled ST. Numeric ST values for the lead selected for channel 1, for the lead selected for channel 2, and for the lead with the maximum ST value are displayed in millimeters and are updated every two seconds.

NOTE: The ST parameter box is displayed only when a 5-leadwire set or no leadwire set is connected to the IPM.

A waveform is not displayed for the ST segment, nor are any alarms available.

NOTE: ST segment values may at times be unavailable for patients with pacemakers.

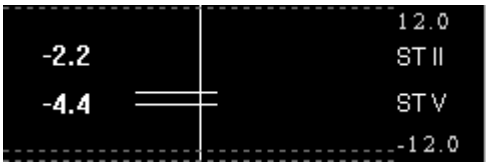
Figure 3-3. ST Segment Analysis Parameter Box

ST Segment Trend (Current Leads)

The ST Segment trend trends ST values for the two currently selected ECG leads.

Trends are displayed by touching the **[Trend]** button in the main screen taskbar. For complete information on trends, see the Narkomed 6000 Operator's Instruction Manual.

Figure 3-4. ST Segment Trend (Current Leads)



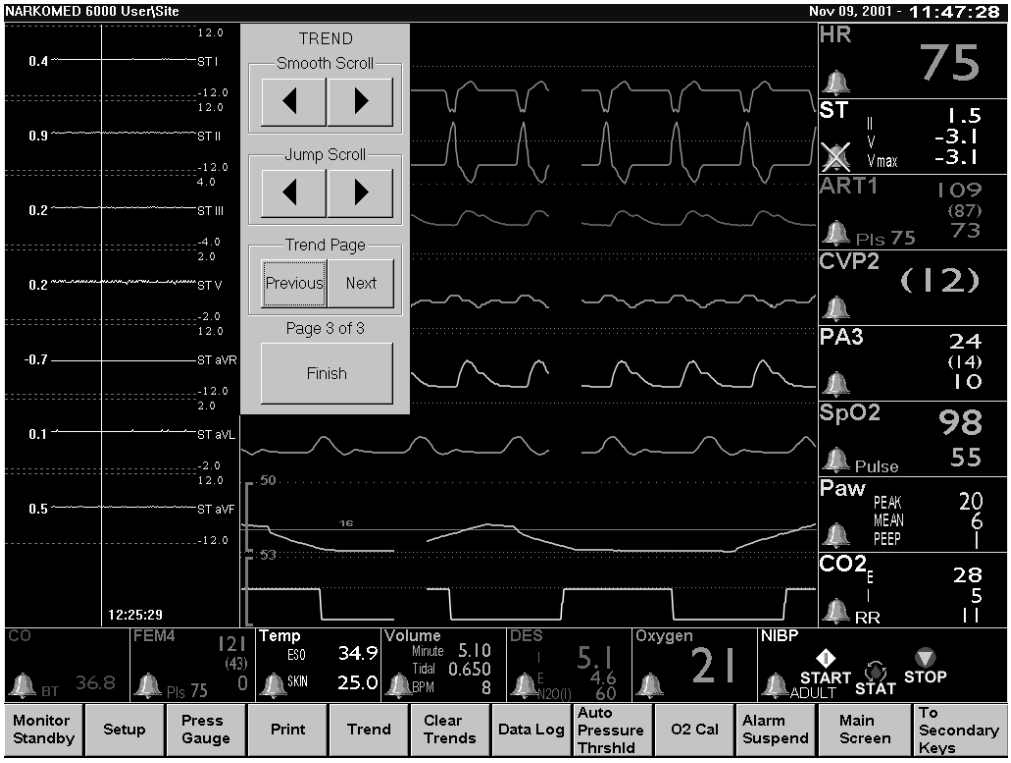
ST Segment Trend (All Leads)

This option allows you to view trends for the following ECG leads: I, II, III, V, aVR, aVL, and aVF.

1. Touch the **[Trend]** button in the main screen taskbar.
2. Touch the displayed trend window to bring up the trend dialog box.
3. Touch the **[Next]** or **[Previous]** button in the dialog box to view other trend pages. The trends for all leads will be displayed.

For complete information on trends, see the Narkomed 6000 Operator's Instruction Manual and Section 2 of this manual.

Figure 3-5. ST Segment Trend (All Leads)



Electrode Placement

ECG Signal Quality

Secure the electrode and leadwire with a leadwire stress loop near the electrode, and tape the stress loop to the patient. This prevents leadwire rotation, leadwire tugging at the electrode, and ECG artifact.

Electrodes should be replaced at least every 48 hours to maintain quality signals. Over the course of 48 hours, the electrode gel will start to dry out and the adhesive will age. The gel or adhesive may also irritate sensitive patient skin.

CAUTION: Line isolation monitor transients may resemble actual cardiac waveforms and, if picked up, may inhibit heart rate alarms. Ensure that leadwires and patient connections are held in place in order to help guard against loosening of connections.

CAUTION: To keep recovery time after defibrillation to a minimum, avoid simultaneous use of electrodes made of dissimilar materials. The use of squeeze bulb electrodes is not recommended.

Surgical Considerations (Adults)

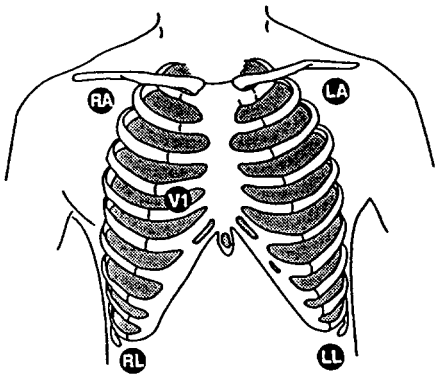
Proper skin preparation is important in order to minimize electrosurgical (ESU) interference. Thoroughly prepare the skin next to the grounding pad as well.

Place the right leg electrode near the ESU grounding pad.

5-Leadwire Electrode Placement

The illustration below shows suggested electrode placement when using 5 leadwires.

Figure 3-6. 5-Lead Electrode Placement



1. Place the right arm (RA) and left arm (LA) electrodes just below the right and left clavicle near the shoulder.
2. Place the right leg (RL) and left leg (LL) electrodes on a non-muscular site in the lower right and left abdomen, just below the rib cage.
3. Place the chest (V) electrode in any of the six chest positions:
   - V1 Fourth intercostal space at the right border of the sternum.
   - V2 Fourth intercostal space at the left border of the sternum.
   - V3 Midway between locations V2 and V4.
   - V4 At the mid-clavicular line in the fifth intercostal space.
   - V5 At the anterior axillary line on the same horizontal level as V4.
   - V6 At the mid-axillary line on the same horizontal level as V4 and V5.

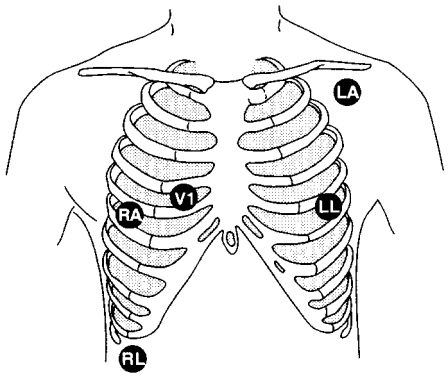
Alternate 3-Leadwire Electrode Configuration

When a 5-leadwire configuration is not desirable, for instance with neonatal monitoring or burn patients, a 3-leadwire cable (RA, LA, and LL) can be used. The clinician can select lead I, II, or III in the ECG notebook.

Electrode Placement for Patients With Pacemakers

The illustration below shows suggested electrode placement for patients with pacemakers.

Figure 3-7. Electrode Placement for Patients with Pacemakers



The procedure is the same as for 5-leadwire placement, except the RA electrode is placed in the right fifth intercostal space. The LL electrode is placed in the left fifth intercostal space. Make sure each lead has at least 1/2 mV of signal after all the electrodes are in place.

ESU ECG Filters

When using the Integrated Patient Monitor in the presence of an electrosurgical unit, the use of the Multi-Link ESU ECG patient cable is recommended. The cable has a built-in ESU filter which helps to reduce ESU noise in the ECG signal.

Preparing for ECG Monitoring

1. Prepare the patient's skin before placing the electrodes. Proper skin preparation is vital to obtaining a good electrical signal. Use the following guidelines for skin preparation:
    - shave the hair from the skin, if necessary
    - clean the skin thoroughly with soap and water
    - dry the skin completely
2. Place the electrodes on the patient.
3. Attach the patient cable to the ECG connector on the Integrated Patient Monitor module.
4. Attach the electrode leadwires to the patient cable.

Standard leadwire labels and colors are identified in the following table.

Table 3-2. Standard Leadwire Labels and Colors

Leadwire	Leadwire Color (AHA)	Leadwire Label (AHA)	Leadwire Color (IEC)	Leadwire Label (IEC)
RA (right arm)	white	RA	red	L
LA (left arm)	black	LA	yellow	R
RL (right leg)	green	RL	black	F
LL (left leg)	red	LL	green	N
V1 (precordial)	brown	V1	white	C1
V2 (precordial)	yellow	V2	yellow	C2
V3 (precordial)	green	V3	green	C3
V4 (precordial)	blue	V4	brown	C4
V5 (precordial)	orange	V5	black	C5
V6 (precordial)	purple	V6	purple	C6

5. Set the appropriate ECG monitoring settings in the ECG notebook.

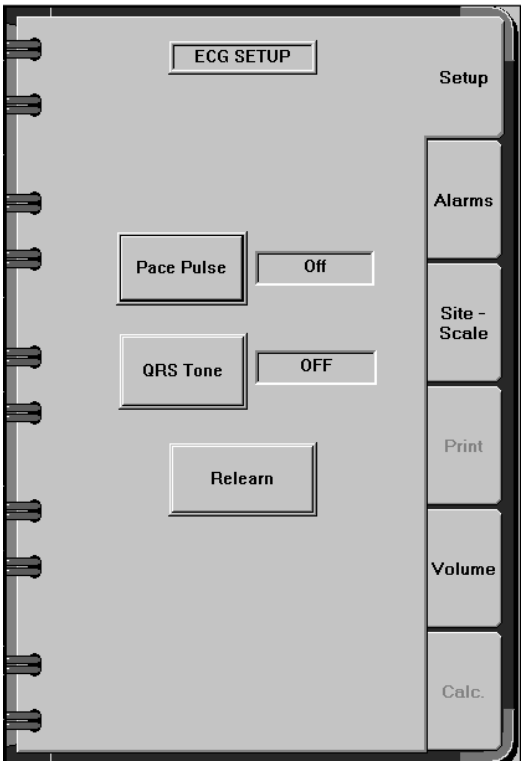
Setting Up ECG Parameters

Touch the ECG parameter box (labeled HR) anywhere except the alarm bell to display the ECG notebook.

ECG Setup Tab

Touch the **[Setup]** tab in the ECG notebook to display the Setup page:

Figure 3-8. ECG Setup Page



Pace Pulse

This option controls pacemaker pulse detection. Follow these procedures to successfully monitor pacemaker patients:

- Use the recommended ECG placement.
- Check each lead in the top trace and locate the lead with the best defined pacemaker spikes. Use this lead for the primary ECG.

The system usually effectively monitors a pacemaker patient when the Normal setting is used. However, try the Alternate setting if problems occur.

WARNING: False low heart rate or false asystole indicators can result due to electrical overshoots in certain pacemakers.

WARNING: Do not monitor pacemaker patients without the pace program activated.

WARNING: Do not use pacemaker spike and shape for diagnostic interpretation.

WARNING: Monitor pacemaker patients closely and do not rely entirely on the rate meter alarms. Rate meters can continue to count the pacemaker rate during cardiac arrest and some arrhythmias. For pacemaker pulse rejection capability, see Section 9 - “Specifications”.

Touch **[Pace Pulse]** or its associated selection field until the desired setting is displayed:

- Off - turns off pacemaker pulse detection
- Normal - pacemaker pulse detection that disregards events occurring within a few milliseconds after a pacer pulse
- Alternate - pacemaker pulse detection that monitors events occurring within a few milliseconds after a pacer pulse

WARNING: When the Normal or Alternate settings are used, a pacemaker pulse could be falsely counted as a QRS during asystole.

When Normal or Alternate are chosen, a “P” appears in the ECG parameter box and an artificial spike is placed on the ECG waveform (upper waveform only).

A pacer spike of greater amplitude is added to the analog output from the Integrated Patient Monitor when pace detection is on and detection occurs.

QRS Tone

Touch **[QRS Tone]** or its associated selection field to toggle the state of the QRS tone ON or OFF.

NOTE: When the QRS tone is set to OFF, the SpO_2 tone is automatically set to ON; when the QRS tone is set to ON, the SpO_2 tone is automatically set to OFF.

Relearn

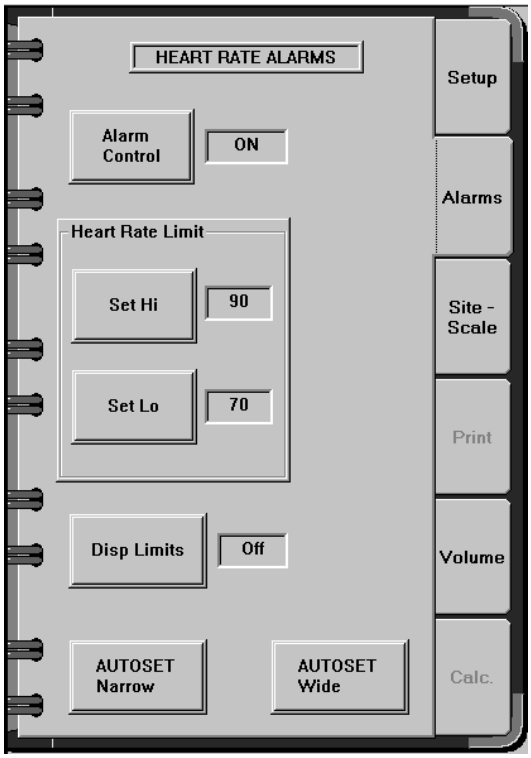
Relearn is a command button that causes the system to learn the patient’s new ECG pattern. The relearn function is used when a significant change in the patient’s ECG pattern occurs that could affect the accuracy of subsequent measurements. A change in the patient’s ECG pattern can result in losing ST measurements, inaccurate heart rate, or both.

Touch **[Relearn]**. The heart rate numeric value and the heart icon are removed from the ECG parameter box and the message **Relearn in Progress** is displayed until the system learns the new ECG pattern.

ECG Alarms Tab

Touch the **[Alarms]** tab in the ECG notebook to display the Alarms page:

Figure 3-9. ECG (Heart Rate) Alarms Page



Alarm Control

Use this option to turn the ECG alarm notification system on or off.

Touch **[Alarm Control]** or its associated selection field until the desired option is displayed:

- On - turns the ECG alarms notification system on
- Off - turns the ECG alarm notification system off
- Stby - suspends the alarm notification system for ECG monitoring. The alarms are turned on automatically as soon as Integrated Patient Monitor communications are established.

Heart Rate Limit-Set Hi

This option sets the high alarm limits for ECG. The range of available settings is 31 to 300 bpm. The lowest possible setting must be one bpm higher than the low alarm setting. The default setting is 150 bpm.

1. Touch **[Set Hi]** or its associated selection field to activate the slider bar.

2. Move the slider control until the desired setting is displayed next to the **[Set Hi]** button.
    - Use the fine adjustment to change the setting by 1 bpm.
    - Use the coarse adjustment to change the setting by 10 bpm.

Heart Rate Limit-Set Lo

This option sets the low alarm limits for ECG. The range of available settings is 30 to 299 bpm. The highest possible setting must be one bpm lower than the high alarm setting. The default setting is 50 bpm.

1. Touch **[Set Lo]** to activate the slider bar.
2. Move the slider control until the desired setting is displayed next to the **[Set Lo]** button.
    - Use the fine adjustment to change the setting by 1 bpm.
    - Use the coarse adjustment to change the setting by 10 bpm.

Disp Limits

Touch **[Disp Limits]** or its associated selection field to toggle the display of alarm limits in the ECG parameter box ON or OFF.

AUTOSET Narrow

This option sets heart rate alarm limits to +/- 10 of the current reading within the 30 to 300 beats/minute range. When the autoset limit falls below the minimum setting, the lowest possible setting within the range is automatically selected. When the autoset limit exceeds the maximum setting, the highest possible setting within the range is automatically selected.

Touch **[AUTOSET Narrow]**. The setting is automatic. The new range values appear next to the **[Set Hi]** and **[Set Lo]** buttons.

AUTOSET Wide

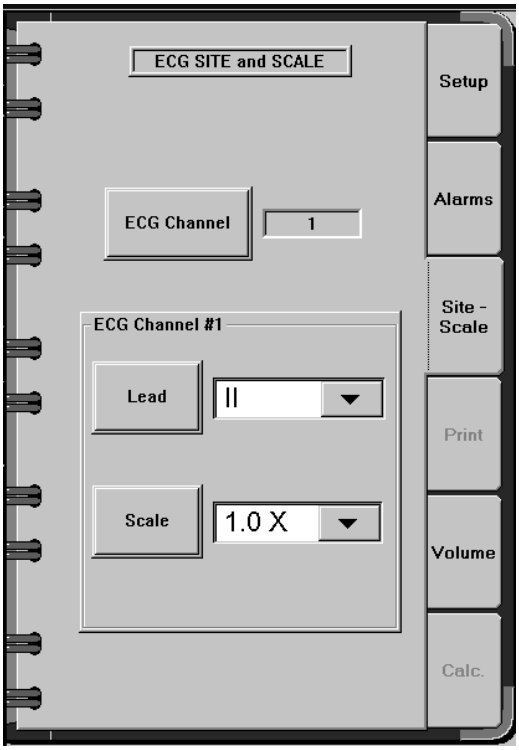
This option sets heart rate alarm limits to +/- 20 of the current reading within the 30 to 300 beats/minute range. When the autoset limit falls below the minimum setting, the lowest possible setting within the range is automatically selected. When the autoset limit exceeds the maximum setting, the highest possible setting within the range is automatically selected.

Touch **[AUTOSET Wide]**. The setting is automatic. The new range values appear next to the **[Set Hi]** and **[Set Lo]** buttons.

ECG Site-Scale Tab

Touch the **[Site-Scale]** tab in the ECG notebook to display the Site-Scale page:

Figure 3-10. ECG Site-Scale Page



ECG Channel

The **[ECG Channel]** button is used to select the screen location currently being set up. Channel 1 is the top waveform location and Channel 2 is the second waveform location from the top.

NOTE: The Channel 2 waveform area is displayed on the screen only when a 5-leadwire set or no leadwire set is connected to the IPM.

Touch **[ECG Channel]** or its associated selection field until the desired channel is displayed.

Lead

This option specifies the lead displayed for each ECG channel. The choices include I, II, III, V, aVR, aVL, and aVF.

Touch **[Lead]** or its associated selection field to display the list of options, then touch the correct lead identifier.

NOTE: It is not possible to display duplicate ECG leads simultaneously.

Scale

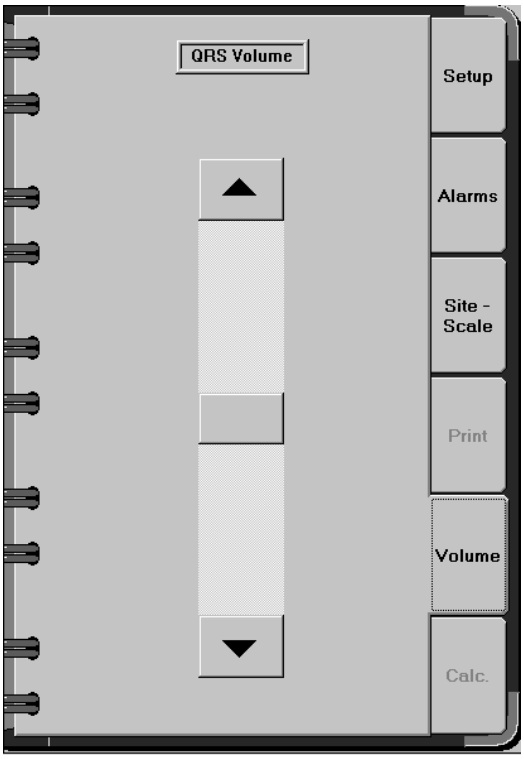
This option sets the scale for the selected lead. The choices include 0.25x, 0.5x, 1.0x, 2.0x, and 4.0x.

Touch **[Scale]** or its associated selection field to display the list of options, then touch the desired scale value.

ECG Volume Tab

Touch the **[Volume]** tab in the ECG notebook to display the Volume page:

Figure 3-11. ECG (QRS) Volume Page



QRS Volume

Use this option to adjust the volume for the QRS complex tone.

Move the slider control to adjust the volume. The relative position of the control indicates the setting. The volume is turned off when the slider control is at the bottom of the slider. The setting is the highest when the slider control is at the top.

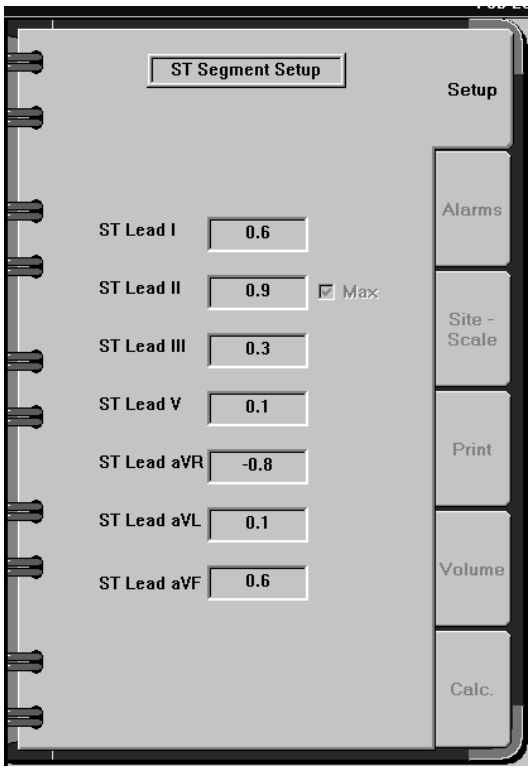
Setting Up ST Segment Analysis Parameters

Touch the ST parameter box anywhere except the alarm bell to display the ST segment notebook.

ST Segment Analysis Setup Tab

Touch the Setup tab in the ST notebook to display the ST segment Setup page:

Figure 3-12. ST Segment Setup Page



The ST segment Setup page displays real time ST values for all seven ECG leads. These values are updated every two seconds.

NOTE: Alarms are not available for ST segment data.

Summary of Alarms

This section contains all warning, caution, and advisory alarms associated with ECG monitoring.

NOTE: This summary assumes that the patient's condition is checked before attempting to change any system settings when patient condition alarms occur.

Table 3-3. ECG Warnings

Message	Condition	Suggested Action
ASYSTOLE	No systolic heartbeat is detected for 6 seconds and the heart rate is less than 30 beats/minute	If the patient's condition is not the cause, check the ECG leads placement of electrodes, or check the skin preparation. Also check the ECG settings, waveform scale, or set the system to relearn the ECG signal. At least a .5 mV amplitude is needed for QRS detection (at 1.0 size).
HEART RATE LOW	The heart rate is below the alarm limit setting	Check the patient. If needed, change the alarm limit setting.

NOTE: When an ASYSTOLE condition persists continuously for approximately three (3) minutes, the ASYSTOLE and HEART RATE LOW alarms will be automatically cleared.

Table 3-4. ECG Cautions

Message	Condition	Suggested Action
HEART RATE HIGH	The heart rate exceeds the alarm limit setting	Check the patient. If warranted, change the alarm limit setting.

Table 3-5. ECG Advisories

Message	Condition	Suggested Action
ECG LEADS ERR	The system is not getting adequate signals from the ECG leads	Check RL lead. Check all leads for proper connections at the electrode and the Integrated Patient Monitor module.
SRVC CV MON	Internal system fault	Contact an authorized representative of DrägerService.
ECG (xx) DISC or ECG LEAD V ERR	The identified lead is not sending adequate signals to the system	Check lead and electrode placement.
ECG SIG ERR	ECG artifact detected	Switch to view another lead waveform. Check the electrode placement and lead connections at the electrode and the Integrated Patient Monitor module.

Problem Resolution

Inaccurate heart rate:

- Check the leads. Adjust them if necessary.
- Make sure the patient's skin was properly prepared.
- Check the electrode placement. Reposition them correctly on the patient. Replace the electrodes, if needed.
- Check the waveform scale. Select higher scales to increase QRS detection, e.g., 4x scale provides maximum sensitivity. This may be helpful for low amplitude QRS waveforms. Use with caution since baseline artifact may be detected as QRS.
- Relearn the ECG.

Heart rate double counting, inaccurate alarms for low heart rate or asystole, or pacemaker spikes not recognized for pacemaker patients:

- Reassign the lead in the top position.
- Try another electrode placement.

Care and Cleaning

Clean cables, leads, and electrodes after each use using mild detergent and a soft, damp cloth.

Check the cables, leads, and electrodes for any signs of damage.

Hang the cables and leads or lay them flat to prevent damage.

To avoid damaging the components and accessories, **do not:**

- Use acetone, alcohol, ammonia, chloroform, or other strong solvents, because they can eventually damage the vinyl casing
- Immerse the cables in water
- Autoclave leads, cables, or electrodes
- Use heavy abrasives such as steel wool for cleaning

4

IBP Monitoring

This section contains configuration and operational information specific to Invasive Blood Pressure (IBP) Monitoring.

Overview

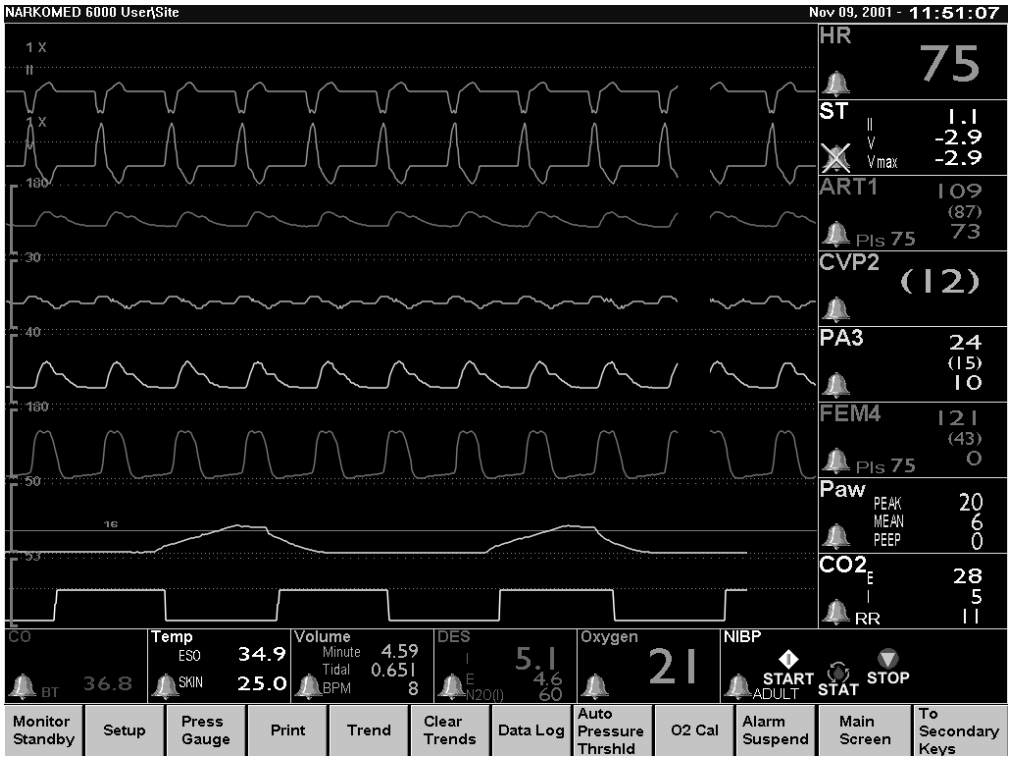
The Narkomed 6000 with the Integrated Patient Monitor option can monitor up to four invasive blood pressures. The Integrated Patient Monitor processes information provided by strain-gauge transducers to monitor and display pressure values. Pulsatile and nonpulsatile blood pressures can be monitored.

For pulsatile sites, the numeric systolic, diastolic, and mean pressures are displayed. Pulse rates are also displayed for arterial and femoral sites. The numeric mean pressure is displayed for nonpulsatile sites.

IBP Display

The Narkomed 6000 can display up to four waveforms and corresponding numerical data from transducers in channels P1, P2, P3, and P4.

Figure 4-1. IBP Waveforms and Parameter Boxes (ART1, CVP2, PA3, & FEM4)



The IBP parameter boxes are identified by labels that correspond to the site and channel being monitored. The current IBP value is shown next to its label. Systolic, diastolic, and/or mean values can be displayed, depending on the pressure site being monitored. The pulse rate is displayed next to its label (Pls). When a transducer zero is required, the message ZERO BP appears in the center of the parameter box.

The numeric display range for the systolic, diastolic, and mean values for all sites is -98 to 350 mmHg. The numeric display range for the pulse rate is 0 to 333 bpm. All values are updated every two seconds.

The following table lists sites and corresponding labels and displayed values:

Table 4-1. Pressure Sites and Labels

Label	Site	Displayed Values
ART	arterial (pulsatile site)	systolic, diastolic, mean, pulse rate
PA	pulmonary artery (pulsatile site)	systolic, diastolic, mean
FEM	femoral (pulsatile site)	systolic, diastolic, mean, pulse rate
CVP	central venous pressure (nonpulsatile site)	mean
RA	right atrial (nonpulsatile site)	mean
LA	left atrial (nonpulsatile site)	mean
ICP	intracranial pressure (nonpulsatile site)	mean, cpp
SP	special (nonpulsatile site)	mean

NOTE: Pulse rate is not available for the PA site.

NOTE: CPP is present only if an ART or FEM site is active along with the ICP site.

The color of the waveform is the same as the color of the corresponding IBP numeric data. The waveforms can be scaled either by a selection made in the Site-Scale page of the corresponding IBP setup notebook or by touching the scale shown in the upper left area of the waveform. The available scaling options are 20, 30, 40, 60, 100, 180, 200, and 300. Also, if the Templates and Sounds option is installed, scales specific to IBP site can be stored in a template. The factory default scale values for each IBP site are given in Appendix 2.

IBP Trend

Trends are displayed by touching the **[Trend]** button in the main screen taskbar. For complete information on trends, see the Narkomed 6000 Operator's Instruction Manual.

Each IBP trend is labeled with IBP site and channel. The IBP site can be changed in the Site-Scale page of the IBP notebook; the channel setting cannot be changed. The low scale value for all IBP trends is 0 mmHg and the high scale value is 200 mmHg.

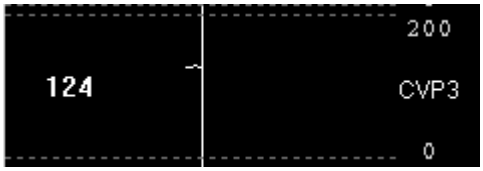
The number of parameters trended in an IBP trend varies by site. The ART, FEM, and PA sites trend three parameters: Systolic (high point of the trend), Diastolic (low point of the trend), and Mean (a black line through the trend). See Figure 4-2.

Figure 4-2. Example of IBP Trend (ART, FEM, and PA Sites)

NOTE: Because the trend for ART, FEM, and PA sites is a filled region, any measurements that exceed the trend range of 0–200 will not be displayed in the trend window.

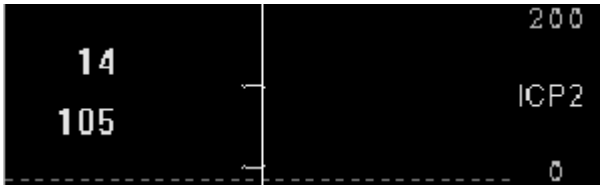
The CVP, RA, LA, and SP sites trend a single parameter–Mean–represented by a single line. See Figure 4-3.

Figure 4-3. Example of IBP Trend (CVP, RA, LA, and SP Sites)



The ICP site trends two parameters–Mean and CPP–each represented by a single line. See Figure 4-4.

Figure 4-4. Example of IBP Trend (ICP Site)



Preparing for IBP Monitoring

1. Apply the IBP catheter to the patient.
2. Attach the patient cable to the appropriate IBP connector labeled P1 through P3 on the Integrated Patient Monitor module.
3. Ensure that the pressure transducer is at the same level as the heart.
4. Zero the pressure transducer (see “Zeroing the Transducer” for more information).
5. Configure all IBP monitoring variables (see “Setting Up IBP Parameters” for more information).

Zeroing the Transducer

All transducers can be zeroed simultaneously by pressing the Zero All key on the Integrated Patient Monitor interface panel. The Zero Transducer option in the IBP setup notebook zeroes only the channel displayed on the page.

NOTE: When a transducer zero is required, the message ZERO BP appears in the IBP parameter box.

Follow this procedure:

1. Close the transducer stopcock.
2. Open the venting stopcock to atmosphere.
3. Display the Setup page of the IBP notebook and press Zero Transducer or press Zero All on the front of the Integrated Patient Monitor module. When the system is zeroed, zeroes appear in the IBP parameter boxes. If a channel cannot be zeroed because it is currently measuring a non-static pressure, the message **PRESS** appears in the corresponding parameter box for a few seconds.
4. When zero reference is established, close the venting stopcock and open stopcock to the patient. If the zeroes do not appear, check the stopcock and try this procedure again. Contact an authorized representative of DrägerService if the procedure fails again.

Setting Up IBP Parameters

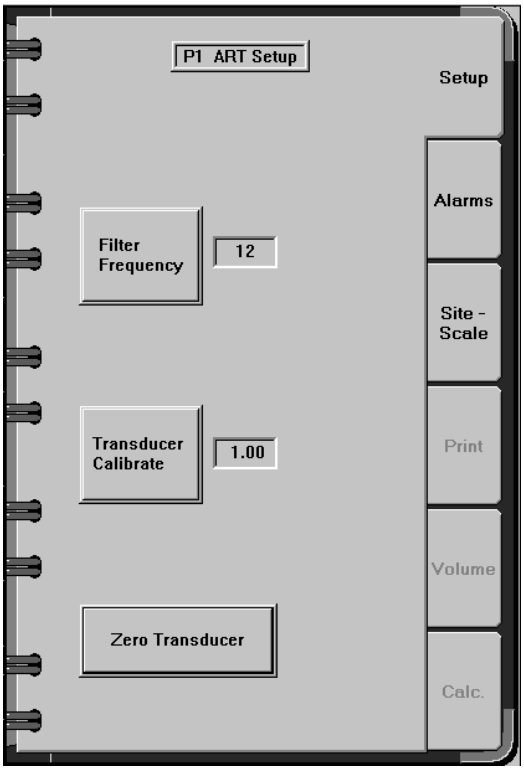
Touch the IBP parameter box anywhere except the alarm bell to display the IBP notebook for the selected pressure channel (P1 through P3).

The title at the top of each IBP notebook page indicates both the channel (P1, P2, or P3) and the currently selected site for the corresponding parameter box.

IBP Setup Tab

Touch the Setup tab to display the IBP setup options.

Figure 4-5. IBP Setup Page for ART



Filter Frequency

Use this option to set the correct low pass filter cutoff frequency.

Touch **[Filter Frequency]** until the desired setting is displayed:

- 12 - sets the filter frequency at 12 Hz
- 40 - sets the filter frequency at 40 Hz

Transducer Calibrate

Use this option to calibrate the transducer. The range for the calibration value is 0.90 to 1.10.

NOTE: Error is determined when a pressure calibration is performed with another instrument like a manometer.

1. Touch **[Transducer Calibrate]** or its associated selection field to activate the slider bar.
2. Move the slider control until the desired setting is displayed next to the **[Transducer Calibrate]** button.
   - Use the fine adjustment to change the setting by 0.01.
   - Use the coarse adjustment to change the setting by 0.05.

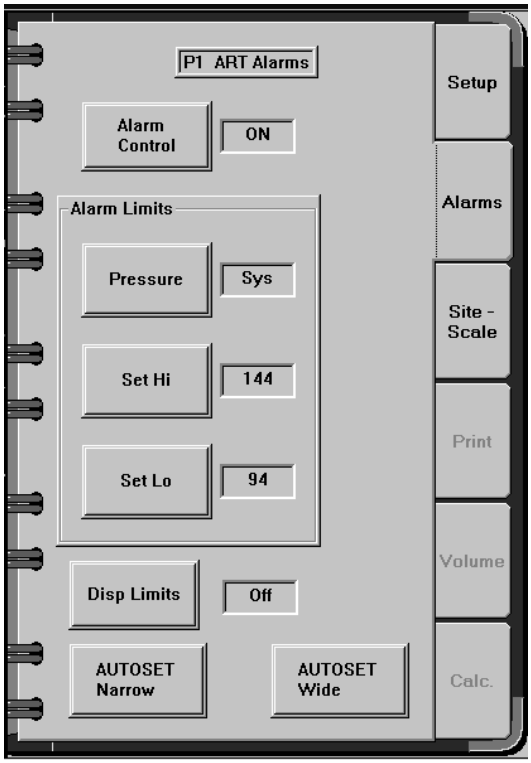
Zero Transducer

This option initiates a zeroing procedure on the individual pressure transducer. For more information, see “Zeroing the Transducer” earlier in this chapter.

IBP Alarms Tab

Touch the **[Alarms]** tab in the IBP notebook to display the alarms page.

Figure 4-6. IBP Alarms Page for ART



Alarm Control

Use this option to set or suspend the IBP alarm notification system.

Touch **[Alarm Control]** or its associated selection field until the desired setting is displayed:

- On - turns the alarm notification system on for that IBP site only
- Off - turns the alarm notification system off for that IBP site only

- Stby (standby) - suspends the alarm notification system for that IBP site until valid data for that site is received, then the alarm notification system for that site only is turned on

Alarm Limits-Pressure

Use this option to select a pressure parameter for setting alarm limits. The alarm limits are established for systolic, diastolic, and mean pressures for the sites monitored. For IBP sites that do not support systolic and diastolic values, the Pressure field is permanently set to Mean.

Touch **[Pressure]** until the desired parameter is displayed:

- Sys - for setting the alarm limits for systolic pressures for that site
- Mean - for setting alarm limits for mean pressures for that site
- Dias - for setting the alarm limits for diastolic pressures for that site

After the pressure parameter is selected, alarm limits can be set. The settings for each pressure parameter are independent and do not affect settings for other pressure parameters or any other site.

Alarm Limits-Set Hi

This option sets the high alarm limits for IBP. The range of available settings is -97 to 350 mmHg. The lowest possible setting for the high alarm limit must be 1 mmHg higher than the current low alarm setting. The default setting is 300 mmHg.

1. Touch **[Set Hi]** or its associated selection field to activate the slider bar.
2. Move the slider control until the desired setting is displayed next to the **[Set Hi]** button.
    - Use the fine adjustment to change the setting by 1 mmHg
    - Use the coarse adjustment to change the setting by 10 mmHg

Alarm Limits-Set Lo

This option sets the low alarm limits for IBP. The range of available settings is -98 to 349 mmHg. The highest possible setting for the low alarm limit must be one mmHg lower than the high alarm setting. The default setting is -30 mmHg.

1. Touch **[Set Lo]** or its associated selection field to activate the slider bar.
2. Move the slider control until the preferred setting is displayed next to the **[Set Lo]** button.
    - Use the fine adjustment to change the setting by 1 mmHg
    - Use the coarse adjustment to change the setting by 10 mmHg

Disp Limits

Touch **[Disp Limits]** or its associated selection field to toggle the display of alarm limits in the IBP parameter box ON or OFF for that site only.

NOTE: If the site label is ART or FEM, displaying the alarm limits will remove the displayed pulse value from the numeric box.

AUTOSET Narrow

This option sets pressure alarm limits +/-25 from the current pressure reading within the -98 to 350 mmHg range. When the autoset limit falls below the minimum allowable range, the lowest setting within the acceptable range is automatically selected. When the autoset limit exceeds the maximum setting, the highest possible setting within the range is automatically selected.

Touch **[AUTOSET Narrow]**. The change is automatic. The new range values appear next to the **[Set Hi]** and **[Set Lo]** buttons.

AUTOSET Wide

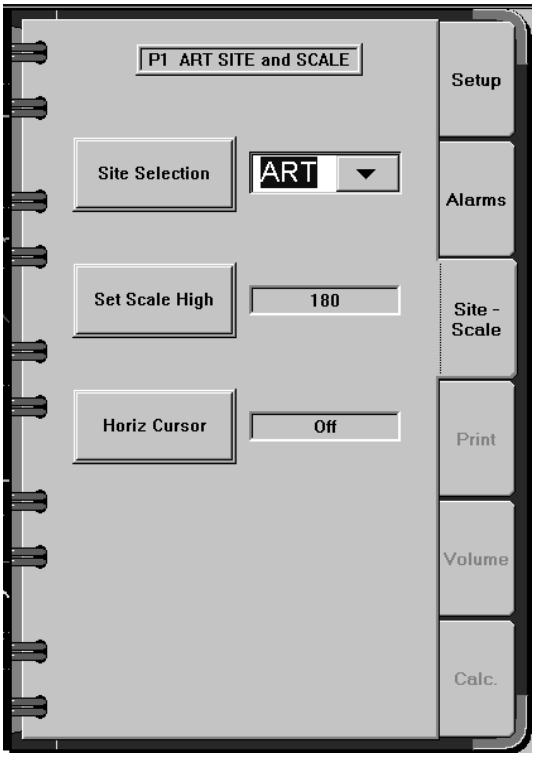
This option sets pressure alarm limits +/-50 from the current pressure reading within the -98 to 350 mmHg range. When the autoset limit falls below the minimum allowable range, the lowest setting within the acceptable range is automatically selected. When the autoset limit exceeds the maximum setting, the highest possible setting within the range is automatically selected.

Touch **[AUTOSET Wide]**. The change is automatic. The new range values appear next to the **[Set Hi]** and **[Set Lo**] buttons.

IBP Site-Scale Tab

Touch the Site-Scale tab in the IBP notebook to display the Site-Scale page:

Figure 4-7. IBP Site-Scale Page for ART



Site Selection

Use this option to select the site label for the pressure channel used. If a new site is chosen, all labels and data values in the parameter box, setup notebook, data log, trend, and waveform (if any) are updated to reflect the new site.

Touch **[Site Selection]** or its associated selection field to open the list box, then touch the desired setting:

- ART - arterial pulsatile pressure
- PA - pulmonary artery pulsatile pressure
- FEM - femoral pulsatile pressure
- CVP - central venous pressure nonpulsatile pressure
- RA - right atrial nonpulsatile pressure
- LA - left atrial nonpulsatile pressure
- ICP - intracranial pressure nonpulsatile pressure
- SP - special-use this option for a nonpulsatile pressure site that is not included in the list

Set Scale High

Use this option to set the waveform scale. The choices include 20, 30, 40, 60, 100, 180, 200, and 300.

Touch **[Set Scale High]** or its associated selection field to display the list of options, then touch the desired scale value.

This option is available only when there is a waveform associated with the currently selected IBP site or when there is a Strip Chart Recorder installed in the Narkomed 6000 system.

Horiz Cursor

Use this option to display a reference horizontal cursor on top of the IBP waveform.

Touch **[Horiz Cursor]** or its associated selection field to toggle the display of the cursor ON or OFF. When the cursor is on, the value associated with its position will be displayed above it.

Touch and drag the cursor to any point on the waveform to determine the value of the waveform at that point.

This option is available only when there is a waveform associated with the currently selected IBP site.

Summary of IBP Alarms

This section contains all Warning, Caution, and Advisory alarms associated with IBP monitoring.

NOTE: This summary assumes that the patient's condition is checked before attempting to change any system settings when patient condition alarms occur.

Table 4-2. IBP Cautions

Message	Condition	Suggested Action
(Site) (x) DIAS HI	The diastolic pressure reading for a specific site exceeds the high alarm limit setting	If the alarm setting is too low, access the Alarms page of the IBP notebook and reset the high limit for diastolic pressure
(Site) (x) DIAS LO	The diastolic pressure reading for a specific site is below the low alarm limit setting	If the alarm setting is too high, access the Alarms page of the IBP notebook and reset the low limit setting for diastolic pressure
(Site) (x) MEAN HI	The calculated mean pressure for a specific site exceeds the high alarm limit setting	If the alarm setting is too low, access the Alarms page of the IBP notebook and reset the high limit for mean pressure
(Site) (x) MEAN LO	The calculated mean pressure for a specific site is below the low alarm limit setting	If the alarm setting is too high, access the Alarms page of the IBP notebook and reset the low limit setting for mean pressure
(Site) (x) SYSTOLIC HI	The systolic pressure reading for a specific site exceeds the high alarm limit setting	If the alarm setting is too low, access the Alarms page of the IBP notebook and reset the high limit for systolic pressure
(Site) (x) SYSTOLIC LO	The systolic pressure reading for a specific site is below the low alarm setting	If the alarm setting is too high, access the Alarms page of the IBP notebook and reset the low limit setting for systolic pressure

Table 4-3. IBP Advisories

Message	Condition	Suggested Action
SRVC CV MON	Internal system fault	Contact an authorized representative of DrägerService.
(Site) (x) SENSOR ERR	A sensor has failed at a specific site due to a detached or failing sensor or cable	Check the patient to determine if the sensor is inappropriately placed or dislodged. Check the cable connection from the sensor to the Integrated Patient Monitor module. Contact an authorized representative of DrägerService if the cause cannot be determined.
IBP ZERO ERR	The IBP transducer could not be set to zero	Follow the Zeroing the Transducer procedure again. If it does not work, contact an authorized representative of DrägerService.

NOTE: The (Site) (x) SENSOR ERR alarms are not displayed at initial power-up if present.

Problem Resolution

Displayed pressure values are different than expected:

- check the tubing for bubbles or kinks
- rezero the transducer
- review transducer manufacturer's recommendations

5 Cardiac Output Monitoring

This section contains configuration and operational information specific to Cardiac Output (CO) Monitoring.

Overview

The Narkomed 6000 with the Integrated Patient Monitor option measures and displays thermodilution cardiac output. The clinician can compare multiple trials and waveform displays. The system calculates the average for up to four results.

Baxter and other probes can be used to obtain cardiac output results. These probes are recognized when the clinician enters the calibration constant data, catheter type, and other pertinent information in the cardiac output notebook.

Cardiac Output Display

The cardiac output and blood temperature are displayed in the cardiac output parameter box which is labeled CO.

The numeric display range is 0.2 to 15 liters/minute for cardiac output and 30° C to 42° C for blood temperature. The values are updated every two seconds.

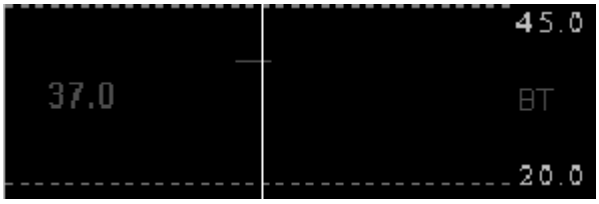
Figure 5-1. Cardiac Output (CO) Parameter Box

Blood Temperature Trend

The blood temperature trend is represented as a single line. The low scale value is 20°C and the high scale value is 45°C.

Trends are displayed by touching the **[Trend]** button in the main screen taskbar. For complete information on trends, see the Narkomed 6000 Operator's Instruction Manual.

Figure 5-2. Blood Temperature Trend



Preparing for Cardiac Output Monitoring

1. Determine whether bath probe or in-line sensor will be used.
2. Make sure the cardiac output settings in the CO notebook are correct. See “Setting up Cardiac Output Parameters.”
3. Insert the catheter in to the patient.
4. Attach the cardiac output cable to the cardiac output connector on the Integrated Patient Monitor module.
5. Ensure that the sensor (bath or in-line) is cabled properly as shown in the following illustrations.
6. Open the CO notebook to the Setup page.
7. Begin the injection when the **Inject When Ready** message appears at the bottom of the CO Setup page. Refer to “Cardiac Output Setup Tab” for more information.
8. Begin the next injection when the **Inject When Ready** message appears again after the **CO Complete** message is displayed.

Figure 5-3. Bath Probe Cable Setup

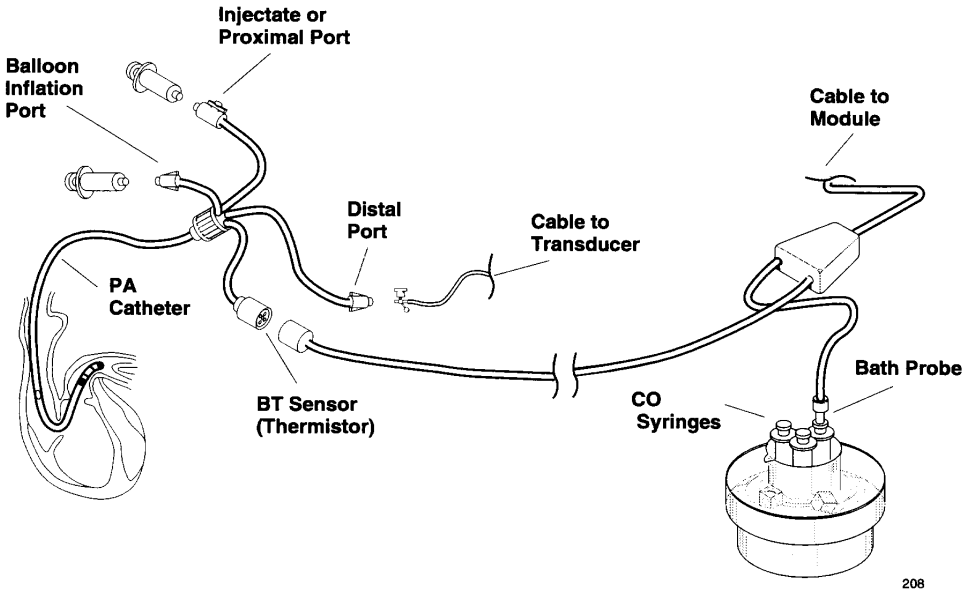
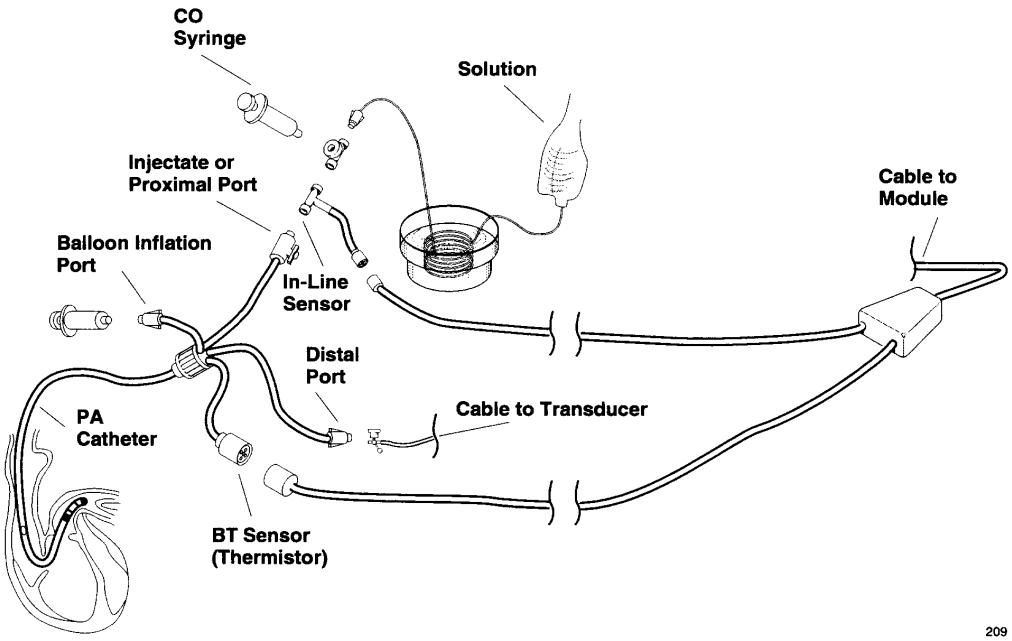


Figure 5-4. In-Line Probe Cable Setup



Suggested Cardiac Output Procedure

1. Set up the appropriate cables for an in-line sensor or bath probe sensor, depending on which procedure will be used.
2. Touch the cardiac output parameter box. Open the notebook to the Setup page. An **Inject When Ready** message should be displayed.

   NOTE: If Other is selected as the catheter type, a computation constant must be entered manually for the **Inject When Ready** message to display (see "Cardiac Output Site-Scale Tab" later in this section).
3. Make other changes to the parameter settings as needed. Settings for these parameters are located on the Site-Scale page. Typical adjustments include:
   - type of injectate temperature probe
   - injectate volume
   - catheter size
   - computation constant
4. Perform the injection. The **Computing** message is displayed and the waveform appears on-screen.
5. The message **CO Complete** appears when the calculation is complete. The cardiac output value and the average are displayed.
6. Perform another injection when the **Inject When Ready** message is displayed.
7. Perform as many injections as needed. Up to four measurements can be taken. When the fifth injection is complete, the first result taken is deleted.
8. When any injection is complete, touch **[Reject]** to delete the last displayed trial results. The average is recalculated automatically.

Setting Up Cardiac Output Parameters

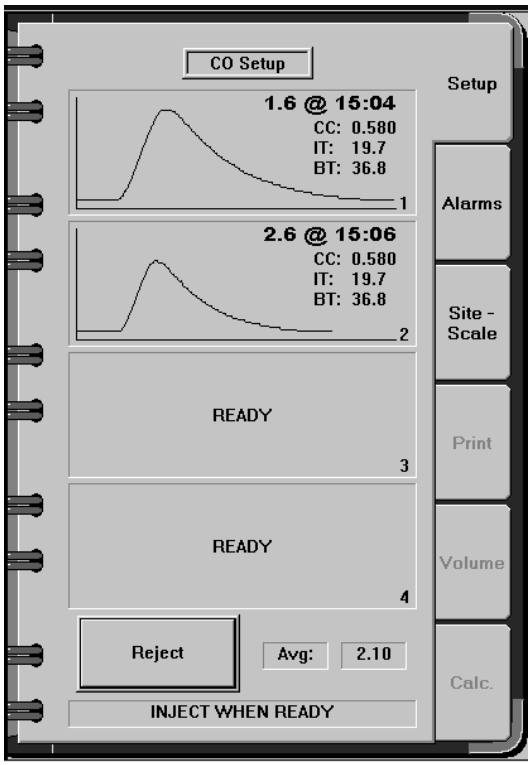
Touch the cardiac output parameter box (labeled CO) anywhere except the alarm bell to display the cardiac output notebook.

Cardiac Output Setup Tab

Touch the **[Setup]** tab to display the cardiac output Setup page.

NOTE: This notebook page must be displayed for a cardiac output measurement to be successfully performed.

Figure 5-5. Cardiac Output Setup Page



Waveform Area

The cardiac output setup page contains up to four waveform graphs, with the most recent measurement at the bottom of the page and the oldest at the top. After four readings are taken, the next cardiac output will replace the oldest reading. In addition to the waveform, each graph contains the following data:

- the cardiac output rate and time the reading was taken
- the computational constant (CC) that was used for the reading
- the injectate temperature (IT)
- the blood temperature (BT)

The **READY** message appears in waveform channels that are ready to accept new waveform data.

Reject

Touch the **[Reject]** button to remove the most recent cardiac output graph and recalculate the average. The reading is deleted from the cardiac notebook page, the data log, and the vital signs report. The next cardiac output reading will be placed in that space.

The **[Reject]** button is disabled during a cardiac output computation and when there are no cardiac output graphs present.

Average

An average (**Avg:**) of the most recent measurements is calculated automatically and displayed at the bottom of the page. If more than four measurements are taken, only the four displayed waveforms are included in the calculation.

Message Area

Messages are displayed at the bottom of the Setup page. These messages indicate system status. The messages and their meanings are listed in the following table.

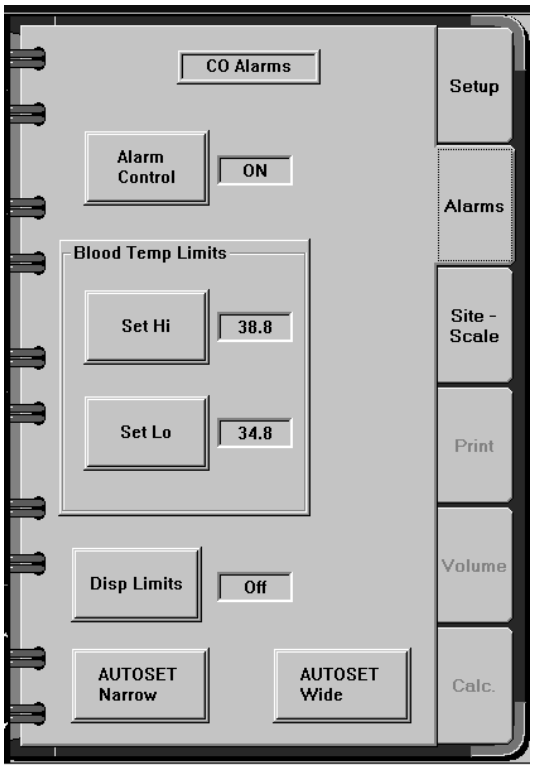
Table 5-1. CO Messages

Message	System Status
INJECT WHEN READY	The system is ready to perform a cardiac output reading. Begin the injection.
COMPUTING	The system is processing the results and calculating the outcome.
CO COMPLETED	The cardiac output waveform is complete.
PLEASE WAIT	The system is not ready for the injection process.
UNSTABLE BT	The system cannot perform a measurement due to unstable blood temperature readings.
UNABLE TO COMPUTE WITH CC=0	The clinician has chosen “Other” for the catheter type on the Site-Scale page but has not set a computation constant.

Cardiac Output Alarms Tab

Touch the Alarms tab in the CO notebook to display the Alarms page:

Figure 5-6. Cardiac Output Alarms Page



Alarm Control

Use this option to turn the blood temperature alarm notification system on or off. Alarms are available for blood temperature, not for cardiac output.

Touch **[Alarm Control]** or its associated selection field until the desired setting is displayed:

- On - turns the cardiac output alarm notification system on
- Off - turns the cardiac output alarm notification system off
- Stby (standby) - suspends the cardiac output alarm notification system until valid blood temperature data is received, then the cardiac output notification system is turned on automatically

Blood Temp Limits-Set Hi

This option sets the high alarm limits for blood temperature. The range of available settings is 30.1 to 42.0 °C. The lowest possible setting for the high alarm limit must be one degree higher than the current low alarm setting. The default setting is 40.0 °C.

1. Touch **[Set Hi]** or its associated selection field to activate the slider bar.

2. Move the slider control until the desired setting is displayed next to the **[Set Hi]** button.
    - Use the fine adjustment to change the setting by 0.1 °C.
    - Use the coarse adjustment to change the setting by 1.0 °C.

Blood Temp Limits-Set Lo

This option sets the low alarm limits for blood temperature. The range of available settings is 30.0 to 41.9 °C. The lowest possible setting for the low alarm limit must be one degree lower than the current high alarm setting. The default setting is 30.0 °C.

1. Touch **[Set Low]** or its associated selection field to activate the slider bar.
2. Move the slider control until the desired setting is displayed next to the **[Set Lo]** button.
    - Use the fine adjustment to change the setting by 0.1 °C.
    - Use the coarse adjustment to change the setting by 1.0 °C.

Disp Limits

Touch **[Disp Limits]** or its associated selection field to toggle the display of alarm limits in the CO parameter box ON or OFF.

AUTOSET Narrow

This option sets the alarm limits to +/- 2° C of the current blood temperature reading within the 30° C to 42° C range. When the autoset limit falls below the minimum setting, the lowest possible setting within the range is automatically selected. When the autoset limit exceeds the maximum setting, the highest possible setting within the range is automatically selected.

Touch **[AUTOSET Narrow]**. The change is automatic. The new settings appear next to the **[Set Hi]** and **[Set Lo]** buttons.

AUTOSET Wide

This option sets the alarm limits to +/- 4°C of the current blood temperature reading within the 30° C to 42° C range. When the autoset limit falls below the minimum setting, the lowest possible setting within the range is automatically selected. When the autoset limit exceeds the maximum setting, the highest possible setting within the range is automatically selected.

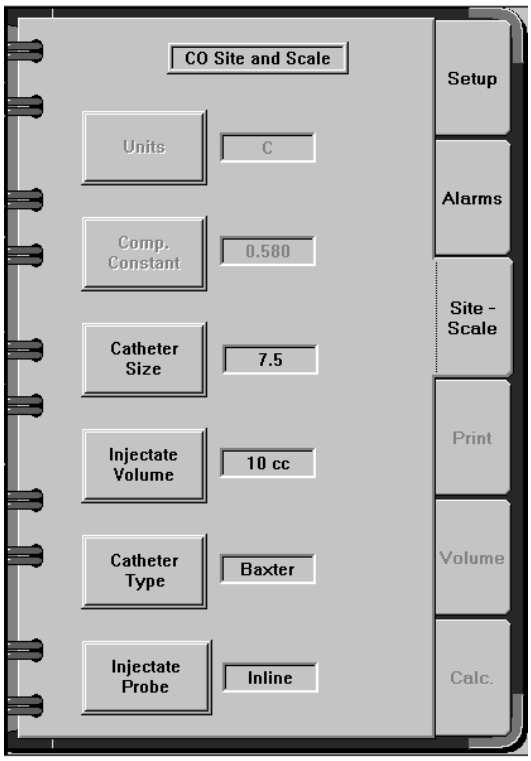
Touch **[AUTOSET Wide]**. The change is automatic. The new settings appear next to the **[Set Hi]** and **[Set Lo]** buttons.

Cardiac Output Site-Scale Tab

Touch the Site-Scale tab in the CO setup notebook to display the Site-Scale page.

If any of the values on the Site-Scale page are changed, any existing cardiac output graphs on the Setup page are removed. The next reading with the new settings will be placed in the first graph on the Setup page.

Figure 5-7. Cardiac Output Site-Scale Page



Units

The system is currently set to calculate and display in Celsius. The option to change the setting is disabled.

Comp. Constant

Use this option to enter the computation constant into the system when a probe other than a Baxter-manufactured probe is used. This option is available only when “Other” is selected for **Catheter Type**. The range for the computation constant is 0.000-0.999.

NOTE: The cardiac output waveforms displayed on the Setup page and any associated calculations are deleted when the computation constant is changed.

1. Touch **[Comp. Constant]** or its associated selection field to activate the slider bar.
2. Move the slider control until the desired setting appears next to the **[Comp. Constant]** button.

- Use the fine adjustment to change the setting by 0.001.
- Use the coarse adjustment to change the setting by 0.010.

NOTE: The catheter type must be set to Other before manually entering the computation constant or the Comp. Constant button will be unavailable. When the computation constant is entered, the catheter size, injectate volume, and injectate probe settings do not need to be changed.

Catheter Size

Use this option to specify the catheter size when a Baxter catheter is used. The catheter size is used to calculate the computation constant.

NOTE: The cardiac output waveforms displayed on the Setup page and any associated calculations are deleted when the catheter size is changed.

Touch **[Catheter Size]** or its associated selection field until the desired size is displayed. The options include 3, 3.5, 4, 5, 6, 7, 7.5, and 8.

Injectate Volume

Use this option to specify the volume of the injectate in cubic centimeters. The volume setting is used to calculate the computation constant.

NOTE: The cardiac output waveforms displayed on the Setup page and any associated calculations are deleted when the injectate volume is changed.

Touch **[Injectate Volume]** or its associated selection field until the correct setting is displayed. The options include 3, 5, and 10.

Catheter Type

Use this option to specify the type of catheter used for the injection. When Baxter is selected, the system calculates the computation constant automatically. When Other is selected, the computation constant must be entered manually.

NOTE: The cardiac output waveforms displayed on the Setup page and any associated calculations are deleted when the catheter type is changed.

Touch **[Catheter Type]** or its associated selection field until the correct setting is displayed - Baxter or Other.

Injectate Probe

Use this option to specify the type of probe being used.

NOTE: The cardiac output waveforms displayed on the Setup page and any associated calculations are deleted when the injectate probe is changed.

Touch **[Injectate Probe]** or its associated selection field until the correct probe is displayed - Inline or Bath.

Summary of Cardiac Output Alarms

This section contains all Warning, Caution, and Advisory alarms associated with cardiac output monitoring.

NOTE: This summary assumes that the patient's condition is checked before attempting to change any system settings when patient condition alarms occur.

Table 5-2. Cardiac Output Cautions

Message	Condition	Suggested Action
T BLOOD HIGH	Blood temperature exceeds the alarm limits	Check the patient. If needed, change the high alarm limit setting.
T BLOOD LOW	Blood temperature is below the alarm limit	Check the patient. If needed, change the low alarm limit setting.

Table 5-3. Cardiac Output Advisories

Message	Condition	Suggested Action
BT SENSOR ERR	The blood temperature sensor is not working	Make sure the sensor is properly placed and connections are secure. If this is not the problem, contact an authorized representative of DrägerService.
SRVC CV MON	Internal system fault	Contact an authorized representative of DrägerService.
INJ TEMP HI	Injectate temperature is too high	Ensure that the injectate temperature is within the 0° to 30° C range.
IT SENSOR ERR	Injectate temperature sensor failure	Ensure that the injectate temperature is within the 0° to 30° C range. Check or replace sensor.

Problem Resolution

Inaccurate cardiac output readings:

- When room temperature solution is used, be sure the bag is not in a warmer area of the room or exposed to other solutions or equipment.
- Do not allow body temperature to affect the solution. Always hold the syringe by the plunger, not by the barrel.
- Allow at least 1 minute between injections to allow the baseline to stabilize.
- To reduce respiratory noise, inject at the patient's end expiration.
- Make sure the solution temperature is at least 10° lower than the patient's temperature.

Care and Cleaning

Remove any adhesive used to attach the cable to the patient. Use a mild detergent in warm water with a soft cloth to wipe the cable clean. Check each cable to corrosion or other signs of damage or deterioration. Make sure the cable is dry before storing. Store the cable flat or hang the cable to prevent damage during storage.

To avoid damaging the components and accessories, **do not**:

- use strong solvents such as acetone, alcohol, ammonia, chloroform on the cable.
- autoclave the cable.

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6

Temperature Monitoring

This section contains configuration and operational information specific to Temperature Monitoring.

Overview

The Narkomed 6000 with the Integrated Patient Monitor option monitors T1 and T2 temperature and calculates the difference between the two. This is in addition to the blood temperature readings available using the cardiac output channel.

Temperature data is acquired by thermistor temperature probes (YSI Series 400 or Series 700). The system automatically senses the type of probe used and processes the data accordingly.

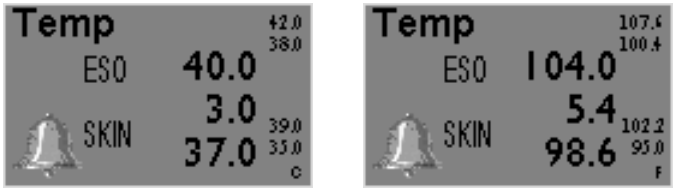
T1 and T2 temperatures are automatically included in the data log in 1-minute intervals.

Temperature Display

The information displayed in the Temperature parameter box depends on the settings made in the Temperature notebook and the System Setup notebook. The temperature parameter box can display the temperatures monitored, the difference between T1 and T2, the site labels, and the alarm limits. Temperature can be displayed in either degrees Centigrade or degrees Fahrenheit.

The numeric display range for temperature is 0 to 45.1°C (32.0 to 113.0°F). The numeric display range for temperature difference is -5 to 5°C (-9.0 to 9.0°F). The values are updated every two seconds.

Figure 6-1. Temperature (Temp) Parameter Box



Temperature Trend

The two temperature parameters that are trended–T1 and T2–are each represented as a single line. The low scale value is 20°C (68°F) and the high scale value is 45°C (113°F).

Trends are displayed by touching the **[Trend]** button in the main screen taskbar. For complete information on trends, see the Narkomed 6000 Operator's Instruction Manual.

Figure 6-2. Temperature Trend

Preparing the Patient for Temperature Monitoring

1. Place the temperature probe(s) on the patient.
2. Attach the patient cable to the Temperature connector(s) on the Integrated Patient Monitor module.
3. Set the Temperature monitoring variables in the Temperature notebook.

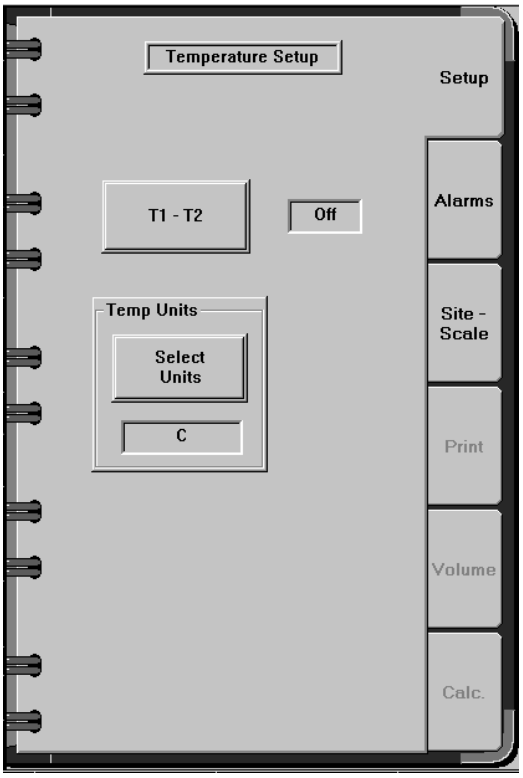
Setting Up Temperature Parameters

Touch the Temperature parameter box anywhere except the alarm bell to display the Temperature notebook.

Temperature Setup Tab

Touch the Setup tab in the Temperature notebook to display the setup options:

Figure 6-3. Temperature Setup Page



T1 - T2

The setting for this option determines whether the difference between T1 and T2 temperature measurements are displayed in the parameter box:

Touch **[T1 - T2]** or its associated selection field to toggle the display ON or OFF.

The difference will be displayed only if both T1 and T2 values are present and the difference is within the valid range of -5 to 5 °C (-9 to 9 °F). The default setting is OFF.

Select Units

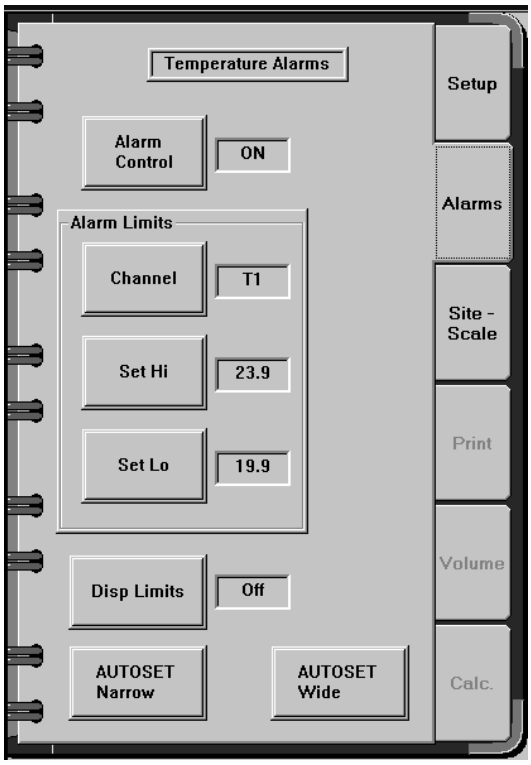
This setting determines whether the temperature readings are displayed in degrees Centigrade or Fahrenheit.

Touch **[Select Units]** or its associated selection field to toggle the temperature units between °C and °F.

Temperature Alarms Tab

Touch the Alarms tab in the Temperature notebook to display the alarms page:

Figure 6-4. Temperature Alarms Page



Alarm Control

Use this option to turn the temperature alarm notification system on or off.

Touch **[Alarm Control]** or its associated selection field until the desired setting is displayed:

- On - turns the temperature alarm notification system on
- Off - turns the temperature alarm notification system off
- Stby (standby) - suspends the temperature alarm notification system until valid temperature data is received, then the notification system is turned on automatically

Alarm Limits-Channel

Use this option to specify the temperature channel for making high and low limit alarm adjustments.

Touch **[Alarm Control]** or its associated selection field until the desired channel (T1 or T2) or channel difference (T1 - T2) is displayed.

After the channel is selected, high and low alarm limits can be set. The settings for each channel are independent and do not affect settings for other channels.

Alarm Limits-Set Hi

This option sets the high alarm limits for temperature. See Table 6-1 for available settings.

1. Touch **[Set Hi]** or its associated selection field to activate the slider bar.
2. Move the slider control until the desired setting is displayed next to the **[Set Hi]** button.
   - Use the fine adjustment to change the setting by 0.1 °C or °F.
   - Use the coarse adjustment to change the setting by 1.0 °C or °F.

Table 6-1. Temperature High Alarm Limits

Alarm Limit	**Default**	**Valid Settings** (must be at least 0.1° greater than low alarm limit)
High T1 and T2	42.0 °C 107.6 °F	0.1 to 45.0 °C 32.1 to 113.0 °F
High T1 - T2	5.0 °C 9.0 °F	-4.9 to 5.0 °C -8.9 to 9.0 °F

Alarm Limits-Set Lo

This option sets the low alarm limits for temperature. See Table 6-2 for available settings.

1. Touch **[Set Low]** or its associated selection field to activate the slider bar.
2. Move the slider control until the desired setting is displayed next to the **[Set Lo]** button.
   - Use the fine adjustment to change the setting by 0.1 °C or °F.
   - Use the coarse adjustment to change the setting by 1.0 °C or °F.

Table 6-2. Temperature Low Alarm Limits

Alarm Limit	**Default**	**Valid Settings** (must be at least 0.1° lower than high alarm limit)
Low T1 and T2	30.0 °C 86.0 °F	0 to 44.9 °C 32.0 to 112.9 °F
Low T1 - T2	-5.0 °C -9.0 °F	-5.0 to 4.9 °C -9.0 to 8.9°F

Disp Limits

Touch **[Disp Limits]** or its associated selection field to toggle the display of alarm limits in the temperature parameter box ON or OFF.

AUTOSET Narrow

This option sets the alarm limits for both temperature channels to ±2°C (±3.6°F) of the current temperature reading within the 0 to 45°C (32 to 113°F) range (±1°C or ±1.8°F for the temperature difference). When the autoset limit falls below the minimum setting, the lowest possible setting within the range is automatically selected. When the autoset limit exceeds the maximum setting, the highest possible setting within the range is automatically selected.

Touch **[AUTOSET Narrow]**. The change is automatic. The new settings appear next to the **[Set Hi]** and **[Set Lo]** buttons.

AUTOSET Wide

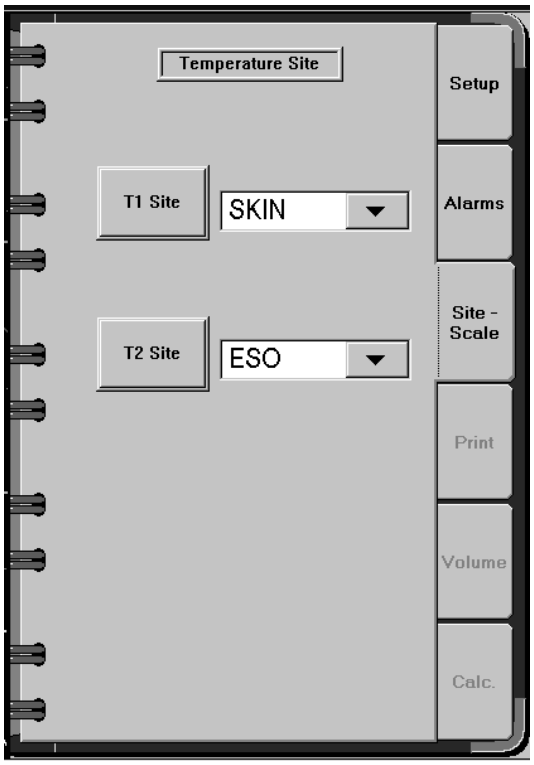
This option sets the alarm limits for both temperature channels to ±4°C (±7.2°F) of the current temperature reading within the 0 to 45°C (32 to 113°F) range (±2°C or ±3.6°F for the temperature difference). When the autoset limit falls below the minimum setting, the lowest possible setting within the range is automatically selected. When the autoset limit exceeds the maximum setting, the highest possible setting within the range is automatically selected.

Touch **[AUTOSET Wide]**. The change is automatic. The new settings appear next to the **[Set Hi]** and **[Set Lo]** buttons.

Temperature Site-Scale Tab

Touch the Site-Scale tab in the Temperature notebook to display the Site-Scale page:

Figure 6-5. Temperature Site-Scale Page



T1 Site,T2 Site

Each site button establishes the patient site used for each temperature probe used.

The site chosen appears next to the temperature reading in the Temperature parameter box.

Touch **[T1 Site]** or **[T2 Site]** or the associated selection field to display the list of options, then touch the desired site. The sites listed include:

Table 6-3. Temperature Sites

Name	site
NONE	none
ESO	esophageal temperature
NAS	nasopharyngeal temperature
TYMP	tympanic temperature
RECT	rectal temperature
BLAD	bladder temperature
AXIL	axillary temperature
SKIN	skin temperature
AIRW	airway temperature
ROOM	room temperature
MYO	myocardial temperature
UKNW	unknown - use this option for temperature probe placements that are not listed among the available sites

Summary of Temperature Alarms

This section contains all warning, caution, and advisory alarms associated with temperature monitoring.

NOTE: This summary assumes that the patient's condition is checked before attempting to change any system settings when patient condition alarms occur.

Table 6-4. Temperature Cautions

Message	Condition	Suggested Action
T1/T2 DIFF	The difference between T1 and T2 high or low alarm limit is exceeded	If the alarm setting is incorrect, reset the T1-T2 limit.
TEMP (number) HIGH	The temperature reading exceeds the high alarm limit	If the alarm setting is incorrect, reset the high alarm limit.
TEMP (number) LOW	The temperature reading is below the low alarm limit setting	If the alarm setting is incorrect, reset the low alarm limit.

Table 6-5. Temperature Advisories

Message	Condition	Suggested Action
TEMP 1 DISC	The T1 connection is interrupted	Check the cable connection to the IPM.
TEMP 2 DISC	The T2 connection is interrupted	Check the cable connection to the IPM.
T1 SENSOR ERR	The T1 connection is interrupted	Check the cable connection to the temperature probe.
T2 SENSOR ERR	The T2 connection is interrupted	Check the cable connection to the temperature probe.
SRVC CV MON	Internal system fault	Contact an authorized representative of DrägerService.

NOTE: The following alarms are not displayed at initial power-up if present: TEMP 1 DISC,TEMP 2 DISC, T1 SENS ERR, T2 SENS ERR.

Problem Resolution

Inaccurate temperature readings:

Check probe placement and adhesion

Care and Cleaning

Use only detergents that do not contain alcohol for disinfection. Use a lint-free cloth to rub the probe down to the direction of the connector.

To avoid damaging the components and accessories, **do not:**

- heat the probe above 100° C
- sterilize the probe in steam
- use alcohol or other strong solutions
- reuse or resterilize disposable probes

7

NIBP Monitoring

This section contains configuration and operational information specific to Noninvasive Blood Pressure (NIBP) Monitoring.

Overview

The Narkomed 6000 with the Integrated Patient Monitor option monitors noninvasive systolic, diastolic, and mean blood pressure.

The current blood pressure measurements are displayed in the NIBP parameter box. Pulse data obtained during an NIBP measurement can also be displayed. In addition, systolic, diastolic, and mean readings are displayed numerically in the Data Log.

The oscillometric method is used to measure pressure. The Integrated Patient Monitor has a pressure transducer and microprocessor to translate cuff pressure oscillations into blood pressure readings. The Integrated Patient Monitor module accepts input from a full range of blood pressure cuffs-from neonatal to large adult sizes.

Some conditions can interfere with accurate blood pressure measurement if a regular arterial pressure pulse cannot be detected, including:

- patient movement (excessive movement, shivering, or convulsing)
- cardiac arrhythmias
- rapid blood pressure changes
- severe shock
- heart rate extremes of less than 30 bpm or more than 300 bpm

WARNING: Noninvasive blood pressure measurement is not recommended for patients in shock or patients with arrhythmias, extremely high or low blood pressure, or an extremely high or low pulse rate.

NIBP Display

NIBP readings are displayed in the NIBP parameter box:

Figure 7-1. NIBP Parameter Box

- systolic blood pressure (top position in large numerals)
- diastolic blood pressure (bottom position in large numerals)
- mean blood pressure (middle position in smaller numerals surrounded by parentheses)
- pulse rate (PLS) below the diastolic blood pressure value (if enabled)
- cuff pressure status on a bar graph (during measurement only)

- countdown timer until next measurement (shown in numerics and illustrated by a pie chart)
- cuff inflation mode (ADULT, PED, or NEO) in lower left corner of parameter box

The numeric display range for all NIBP values is 0 to 300 mmHg. All values are updated every time an NIBP reading is performed. The reading is removed when it is 15 minutes old.

NOTE: The systolic, diastolic, and mean values are removed from the NIBP parameter box if NIBP measurement error alarm messages are posted in the alarm window.

NIBP monitoring is performed in an automatic cycle or in stat mode. The automatic cycle inflates the cuff, takes readings, then deflates the cuff before the next inflation in the time period (interval) set in the Setup notebook. Stat mode provides continuous blood pressure readings for 5 minutes.

Three buttons for making these settings are located in the NIBP parameter box:

START - starts, resumes, or continues blood pressure measurement in the automatic cycle set in the NIBP notebook

STOP - deflates the cuff and suspends blood pressure measurement

STAT - starts continuous blood pressure measurements for 5 minutes

These functions are also performed by pressing the START/STOP and STAT control keys located on the front of the Integrated Patient Monitor module.

NOTE: Under no condition will the Narkomed 6000 with a Integrated Patient Monitor take blood pressure measurements continuously for over 5 minutes. If STAT is pressed during a pressure measurement cycle, the time the cuff was already inflated is taken into account for the 5-minute count.

NOTE: The following conditions may cause the NIBP parameter box to display only the mean blood pressure value, and not display the associated systolic and diastolic values:

- very low systolic and diastolic amplitude fluctuations (e.g. patients in shock)
- very small difference between the mean blood pressure and the systolic pressure or the mean blood pressure and the diastolic pressure
- loss of system identity (e.g. loose connections or worn parts)

If this occurs, be sure to perform a visual inspection to ensure system integrity.

Patient Preparation for NIBP Monitoring

1. Determine the patient's limb circumference
2. Select the correct cuff size for the patient. See "Selecting the Blood Pressure Cuff" that follows for more information about cuff selection.
3. Make sure the cuff is completely deflated.
4. Apply the cuff to the patient in the correct position described in "Placing the Blood Pressure Cuff" that follows.
5. Connect the line to the NIBP connection on the Integrated Patient Monitor module.
6. Arrange the tubing to the right or left of the arm to avoid kinking if the elbow is bent.
7. Make sure the system settings in the NIBP parameter notebook are correct. Instructions for making setting selections follow.
8. When the settings are verified, touch START or STAT to begin readings.

WARNING: Periodically check the patient's limb extremities for signs of circulation impairment, including color changes, temperature changes, and insensitivity. Check the limb more frequently when continuous readings or short automatic intervals such as 1 or 2 minutes are used. Short intervals are not recommended for extended periods. Stop pressure measurements immediately if circulation impairment is evident.

Selecting the Blood Pressure Cuff

Be sure to choose the correct cuff size, patient age setting, and to place the cuff correctly. The cuffs provided in the Accessory Kit are color-coded and the sizes are indicated clearly on the cuff.

Use the following table as a general reference for cuff size selection:

Cuff Size	Limb Circumference	Color
Neonatal	6 to 11 cm	gray
Infant	10-19 cm	tan
Pediatric	18-26 cm	green
Adult	25-35 cm	blue
Large Adult	33-47 cm	red
Thigh	46-66 cm	brown

Use the patient's age range (Neonatal, Pediatric, or Adult) to determine the correct pressure setting. Patient Age is an option in the NIBP notebook Setup page. See "Setting NIBP Parameters - NIBP Setup Tab" for more information.

Placing the Cuff

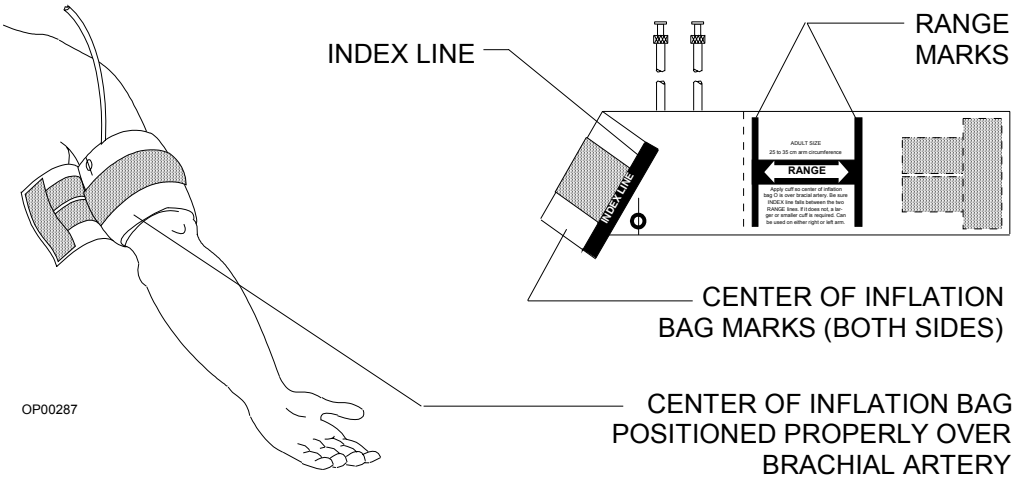
When applying the cuff, place the center of the cuff inflation bag over the artery (for the brachial artery, place the bag on the inside of arm, above the elbow). Make sure the cuff fits securely on the limb and that the INDEX line falls between the two RANGE lines. If the INDEX line does not fall between the RANGE lines, select a smaller or larger cuff. The cuff can be used on either a left or right extremity, but the left is preferred.

CAUTION: Do not place the cuff on a limb being used for infusion. Tissue damage around the catheter can result when the infusion is slowed or blocked during cuff inflation.

Position the cuff at the same level as the patient's heart for an accurate measurement. Placing the cuff above the heart causes the reading to be low. Placing the cuff below the heart causes the reading to be high. Use these general rules when the cuff cannot be placed at heart level:

- For every inch above the heart, add 1.8 mmHg to the reading.
- For every inch below the heart, subtract 1.8 mmHg from the reading.

Figure 7-2. Positioning the Cuff



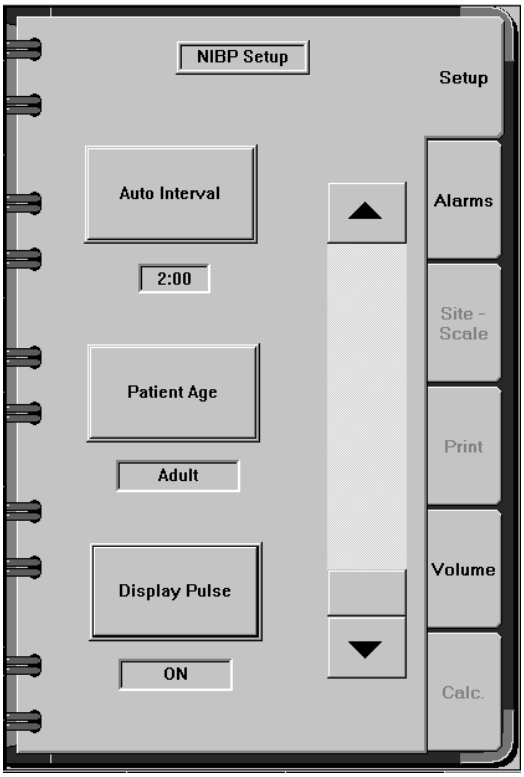
Setting Up NIBP Parameters

Touch the NIBP parameter box (labeled NIBP) in the area to the right of the STOP button to display the NIBP notebook:

NIBP Setup Tab

Touch the Setup tab in the NIBP notebook to display the setup options:

Figure 7-3. NIBP Setup Page



Auto Interval

The interval is the period of time from when the cuff inflates to the next cuff inflation. This interval consists of inflation, measurement, deflation, and rest period before the next interval begins.

[Auto Interval] controls the interval for blood pressure readings. The interval can be set from 2 to 30 minutes in increments of 1/2 minute. The default interval is 5 minutes.

NOTE: Short interval settings are not recommended when blood pressure measurement must be taken for an extended period.

1. Touch **[Auto Interval]** or its associated selection field to activate the slider bar.

2. Move the slider control until the desired setting is displayed. The interval setting is displayed below the **[Auto Interval]** button.
    - Use the fine adjustment to change the setting by 1/2 minute increments.
    - Use the coarse adjustment to change the setting by 5 minute increments.

NOTE: If the interval is changed during a case without pressing STOP, the timing cycle does not start over. The new interval includes the time already elapsed under the previous setting.

The pie chart and associated countdown numerics located in the NIBP parameter box show the new interval.

Patient Age

This option controls the initial and maximum cuff pressure setting based on the patient's age.

Touch **Patient Age** or its associated selection field until the correct setting is displayed. The options include:

Neonatal	for patients ranging in age from newborn to age 2. At this setting, the first inflation pressure is 100 mmHg. Subsequent inflation pressure is 20 mmHg over the last systolic pressure up to 150 mmHg.
Pediatric	for patients ranging in age from 3 to 13 years. At this setting, the first inflation pressure is 130 mmHg, or the last Adult inflation pressure. Subsequent inflation pressure is 30 mmHg over the last systolic pressure up to 250 mmHg.
Adult	for patients over 13 years of age. At this setting, the first inflation pressure is 160 mmHg. Subsequent inflation pressure is 30 mmHg over the last systolic pressure up to 300 mmHg.

The cuff will not exceed maximum pressure. The system automatically turns the pump off and the cuff is deflated if maximum pressure for the selected cuff is exceeded.

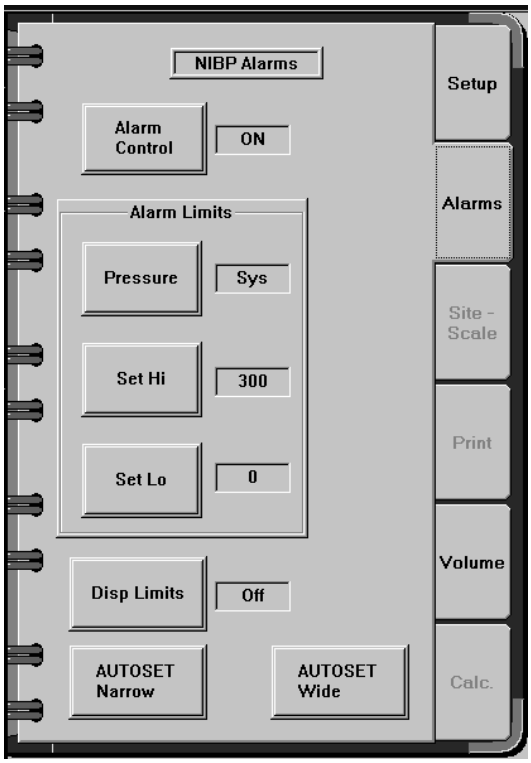
Display Pulse

Touch **[Display Pulse]** or its associated selection field to toggle the display of pulse data in the NIBP parameter box ON or OFF.

NIBP Alarms Tab

Touch the Alarms tab in the NIBP notebook to display the Alarms page:

Figure 7-4. NIBP Alarms Page



Alarm Control

Use this option to turn the NIBP alarm notification system on or off.

Touch **[Alarm Control]** or its associated selection field until the desired setting is displayed:

- On - turns the NIBP alarm notification system on
- Off - turns the NIBP alarm notification system off
- Stby (standby) - suspends the NIBP alarm notification system. The alarms are turned on automatically as soon as Integrated Patient Monitor communications are established.

Alarm Limits-Pressure

Use this option to select a pressure parameter for setting high and low alarm limits.

Touch **[Pressure]** or its associated selection field until the desired parameter is displayed:

- Sys - for setting the alarm limits for systolic pressure
- Mean - for setting alarm limits for mean pressure

- Dias - for setting the alarm limits for diastolic pressure

After the pressure parameter is selected, alarm limits can be set. The settings for each pressure parameter are independent and do not affect settings for other pressure parameters.

Alarm Limits-Set Hi

This option sets the high alarm limits for NIBP. The range of available settings is 1 to 300 mmHg. The lowest possible setting for the high alarm limit must be 1 mmHg higher than the current low alarm setting. The default setting is 300 mmHg.

1. Touch **[Set Hi]** or its associated selection field to activate the slider bar.
2. Move the slider control until the desired setting is displayed next to the **[Set Hi]** button.
    - Use the fine adjustment to change the setting by 1 mmHg
    - Use the coarse adjustment to change the setting by 10 mmHg

Alarm Limits-Set Lo

This option sets the low alarm limits for NIBP. The range of available settings is 0 to 299 mmHg. The highest possible setting for the low alarm limit must be one mmHg lower than the high alarm setting. The default setting is 0 mmHg.

1. Touch **[Set Lo]** or its associated selection field to activate the slider bar.
2. Move the slider control until the preferred setting is displayed next to the **[Set Lo]** button.
    - Use the fine adjustment to change the setting by 1 mmHg
    - Use the coarse adjustment to change the setting by 10 mmHg

Disp Limits

Touch **[Disp Limits]** or its associated selection field to toggle the display of alarm limits in the NIBP parameter box ON or OFF.

AUTOSET Narrow

This option sets pressure alarm limits for all pressure parameters +/- 25 from the current pressure values within the 0 to 300 mmHg range. When the autoset limit falls below the minimum allowable range, the lowest setting within the acceptable range is automatically selected. When the autoset limit exceeds the maximum setting, the highest possible setting within the range is automatically selected.

Touch **[AUTOSET Narrow]**. The change is automatic. The new range values appear next to the **[Set Hi]** and **[Set Lo]** buttons.

AUTOSET Wide

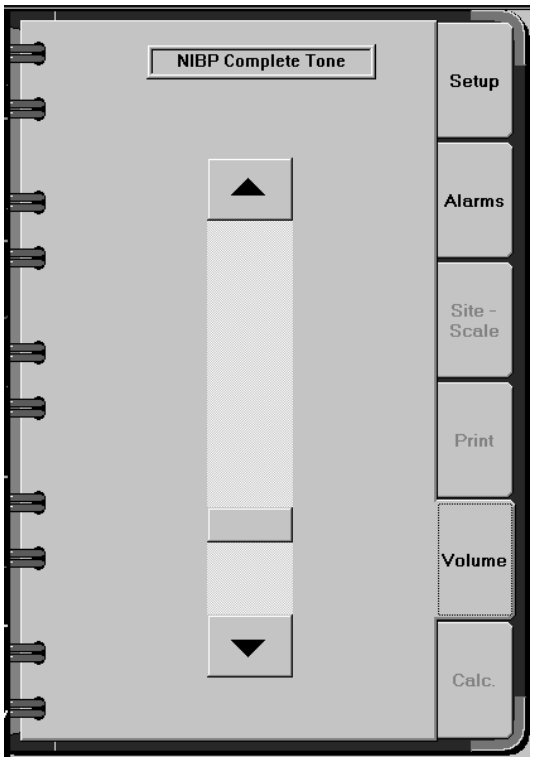
This option sets pressure alarm limits for all pressure parameters +/- 50 from the current pressure values within the 0 to 300 mmHg range. When the autoset limit falls below the minimum allowable range, the lowest setting within the acceptable range is automatically selected. When the autoset limit exceeds the maximum setting, the highest possible setting within the range is automatically selected.

Touch **[AUTOSET Wide]**. The change is automatic. The new range values appear next to the **[Set Hi]** and **[Set Lo**] buttons.

NIBP Volume Tab

Touch the Volume tab in the NIBP notebook to view the Volume page.

Figure 7-5. NIBP Volume Page



The system sounds a single tone when the NIBP is complete. Use this option to adjust the volume for the tone.

Move the slider control to adjust the volume. A test tone is provided for each volume adjustment. When the slider is at the highest position, the tone will be at maximum volume. When the slider is at the lowest position, the tone will be at the minimum volume.

Summary of NIBP Alarms

This section contains all warning, caution, and advisory alarms associated with NIBP monitoring.

NOTE: This summary assumes that the patient's condition is checked before attempting to change any system settings when patient condition alarms occur.

Table 7-1. NIBP Cautions

Message	Condition	Suggested Action
NIBP DIAS HI	The diastolic blood pressure exceeds the high range setting	Check the patient. If in doubt about the measurement, perform an independent blood pressure measurement.
NIBP DIAS LO	The diastolic blood pressure is below the low range setting	Check the patient. If in doubt about the measurements, perform an independent blood pressure measurement.
NIBP MEAN HI	The mean blood pressure is above the high range setting	Check the patient. If in doubt about the measurement, perform an independent blood pressure measurement.
NIBP MEAN LO	The mean blood pressure is below the low alarm setting	If the alarm setting is incorrect, change the mean alarm setting.
NIBP SYSTOLIC HI	The systolic blood pressure reading exceeded the high range setting	Check the patient. If in doubt about the measurement, perform an independent blood pressure measurement.
NIBP SYSTOLIC LO	The systolic blood pressure reading is below the low range setting	Check the patient. If in doubt about the measurement, perform an independent blood pressure measurement.

Table 7-2. NIBP Advisories

Message	Condition	Suggested Action
BP CUFF DISC	The system did not detect a cuff inflation	Check the cuff and its connections and try another measurement. If the cuff is inflated, contact an authorized representative of DrägerService.
CHECK NIBP CUFF	Inflation >5 min., excessive noise, >3 min. for measurement, or exceeds maximum pressure	If the cuff is deflated, try another measurement. Check placement. Check for arrhythmia condition. If the cuff is inflated, remove the cuff and contact an authorized representative of DrägerService.
BP CUFF ERROR	The cuff will not deflate	Remove the cuff and contact an authorized representative of DrägerService.
NIBP LEAK	System pressure leak	Check connections, hoses, cuff.
NIBP STAT	The STAT button was touched and the system is taking continuous blood pressure readings for a period not to exceed 5 minutes	To turn off the STAT mode, touch the STOP or START buttons in the NIBP parameter box.
WEAK NIBP	The system cannot detect a measurable pulse	Perform an independent blood pressure measurement to determine if the system is at fault (see “Problem Resolution”). If a patient condition exists that affects blood pressure measurement, do not use the NIBP method.
SERVICE NIBP	Internal system fault.	Contact an authorized representative of DrägerService.

Problem Resolution

Inaccurate NIBP measurement:

- Make sure the correct cuff size is used. An inaccurate low reading occurs when the cuff is too large. An inaccurate high reading occurs when the cuff is too small.
- Check for residual air left in the cuff from a previous measurement.
- The cuff is applied too tightly or too loosely.
- The cuff and heart are not at the same level.
- The patient is moving.
- There is a leak in the cuff or tubing.
- The system needs calibration.

Care and Cleaning

Avoid allowing any saline solution from an intravenous drip onto the Integrated Patient Monitor module connectors.

Do not allow liquid of any kind to enter the Integrated Patient Monitor module connections when the cables are not plugged in.

Wipe up any spills immediately with a soft, clean cloth.

Do not use strong cleaning solvents.

Avoid kinking or compressing the cuff air tubes.

Do not allow any liquid or foreign objects to enter the cuff air tubes.

Refer to the manufacturer's instructions for the cleaning and sterilization requirements for the blood pressure cuffs. Instructions are provided in the Accessory Kit.

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8

SpO_2 Monitoring

This section contains configuration and operational information specific to SpO_2 Monitoring.

Overview

The Narkomed 6000 with the Integrated Patient Monitor option monitors arterial oxygen saturation and pulse rate.

The SpO_2 monitoring is noninvasive. All information is gathered through a spectrophotometric transmission sensor applied to the patient's finger. Optional sensors can be applied at different sites. The system is compatible with Nellcor SpO_2 sensors and detects a pulse rate in the range of 40 to 235 beats per minute.

The spectrophotometric transmission sensor has two low-power LED light sources and a photodetector. Two wavelengths of transmitted light illuminate the tissue under the probe. The lights are absorbed differently by the oxyhemoglobin and deoxyhemoglobin. The light transmissions are read by the photoreceptor and converted to electrical pulses that represent absorbance. From these electrical pulses, the monitor derives the pulse rate and the percentage of available hemoglobin saturated with oxygen.

The arterial hemoglobin oxygen saturation is calculated as a percentage of total functional hemoglobin (hemoglobin available to transport oxygen). Significant levels of dysfunctional hemoglobin, such as carboxyhemoglobin or methemoglobin, can cause an inaccurate measurement.

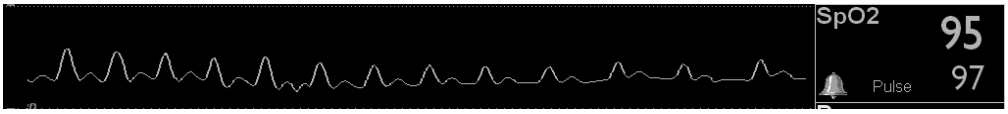
WARNING: SpO_2 monitoring can interfere with MRI operation.

SpO_2 readings and pulse rates are recorded in the Data Log in 1-minute intervals. SpO_2 readings are trended graphically in the trend area.

SpO_2 Display

The SpO_2 parameter box displays the SpO_2 result and pulse rate. The SpO_2 waveform is displayed next to the SpO_2 parameter box. The color of the waveform is the same as the color of the SpO_2 numeric data.

Figure 8-1. SpO_2 Parameter Box and Waveform



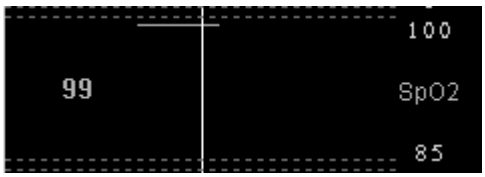
The numeric display range is 0 to 100% for SpO_2 and 40 to 235 bpm for pulse. All values are updated every two seconds.

SpO_2 Trend

The SpO_2 trend is represented as a single line. The low scale value is 85% and the high scale value is 100%.

Trends are displayed by touching the **[Trend]** button in the main screen taskbar. For complete information on trends, see the *Narkomed 6000 Operator's Instruction Manual*.

Figure 8-2. SpO_2 Trend



Preparing for SpO_2 Monitoring

1. Apply the SpO_2 sensor on the patient (see "Applying the Pulse Oximeter Sensor").
2. Attach the patient cable to the SpO_2 connector on the Integrated Patient Monitor module.
3. Make sure all SpO_2 settings in the SpO_2 notebook are correct. Instructions for making setting selections follow.

Applying the Pulse Oximeter Sensor

For accurate readings, it is important to choose the correct sensor type and placement.

Sensor Types

A reusable finger sensor is included in the Accessory Kit in a nonsterile package. Other sensors that have limited reuse capability are available (see Spare and Replacement Parts) and can be applied to different sites. For more information on optional sensors, consult the detailed instructions provided with each sensor.

The supplied finger sensor is recommended for relatively immobile patients who weigh more than 40 kg. It is not recommended for active patients or for prolonged cases (for example, nonanesthesia applications, such as monitoring of long-term respiratory support).

Sensor Site

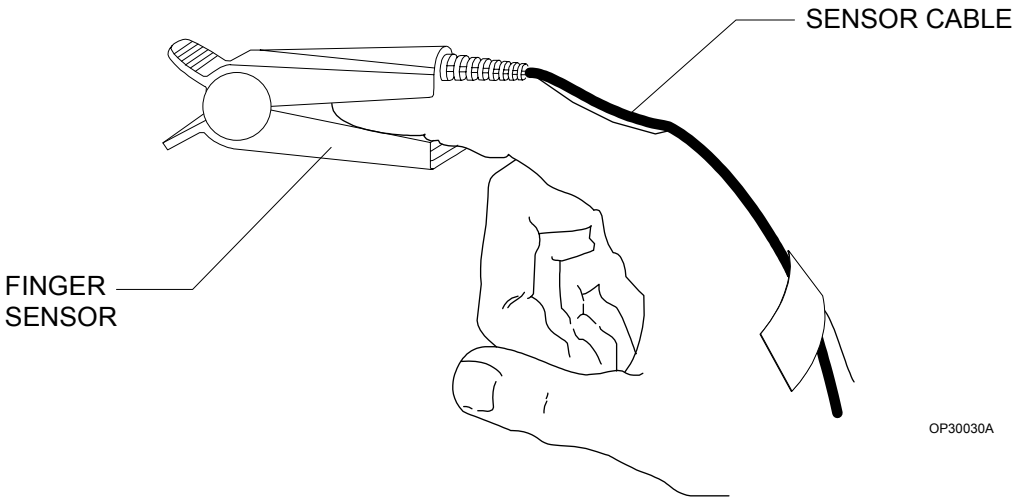
The preferred site for the sensor is the index finger. If another digit must be used, avoid connecting the sensor to large or very small digits. (If the patient is large or obese, use a small finger.)

Do not place the sensor on a thumb or on any toe. Do not place the sensor distal to an inflated pneumatic tourniquet or on an extremity with an arterial catheter in place. Avoid placing the sensor on any extremity with a blood pressure cuff or intravascular venous line. If the sensor must be placed distal to the blood pressure cuff used with the internal noninvasive blood pressure monitor, turn off the pulse oximetry alarms during blood pressure cuff inflation with the NIBP/SpO_2 Interlock (see NIBP Interlock later in this section).

Sensor Application

Apply the sensor with the cable running down the backside of the hand. This ensures that the light source is on the nail side of the finger, and the detector is on the underside. This arrangement allows the sensor light source to shine down through the top side of the finger.

Figure 8-3. Application of the Finger Sensor



The fingertip should lightly touch the stop at the end of the soft pad on the sensor. Make sure that the sensor's side walls are not pinching the finger or causing a pressure point anywhere on the finger.

If the patient has long fingernails, the fingernail tip must extend over the stop to ensure that the fingertip lightly touches the stop.

Do not tape the sensor shut.

For best results, the patient's hand should be at the level of the patient's heart.

NOTE: Check the sensor placement frequently. The sensor must be reapplied to a different appropriate digit at least once every 4 hours, or more often if clinical conditions indicate that the site should be changed.

NOTE: Although the sensor is designed to minimize interference from ambient light, bright light sources (for example, surgical lamps and direct sunlight) can interfere with the accuracy of the measurement. If bright ambient light proves to be a problem, cover the sensor site with an opaque material, such as a towel or blanket.

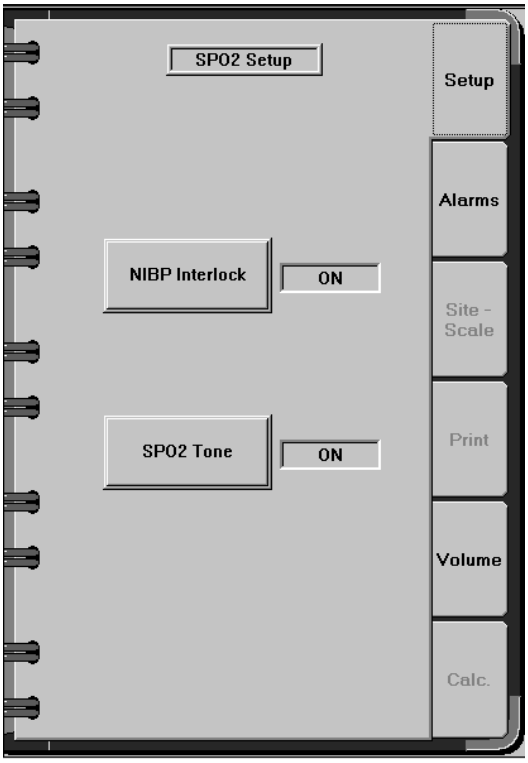
Setting Up SpO_2 Parameters

Touch the SpO_2 parameter box anywhere except the alarm bell to display the SpO_2 notebook.

SpO_2 Setup Tab

Touch the Setup tab in the SpO_2 notebook to display the setup options:

Figure 8-4. SpO_2 Setup Page



NIBP Interlock

This option sets or turns off the interlock function that automatically turns off SpO_2 alarms during a blood pressure cuff inflation. This prevents false pulse alarms when the SpO_2 sensor is placed on the same appendage as the blood pressure cuff.

Touch **[NIBP Interlock]** or its associated selection field until the desired setting is displayed:

- On - turns on the NIBP interlock feature
- Off - turns off the NIBP interlock feature

NOTE: When the interlock function is turned off, the following alarm information applies:

– if an SpO_2 alarm occurs at the time an NIBP measurement begins, it will continue (even if the alarm condition no longer exists) until the NIBP measurement is complete

– likewise, if an SpO_2 alarm occurs while an NIBP measurement is in progress, the alarm will not be posted until the NIBP measurement is complete

SpO_2 Tone

This option determines whether the SpO_2 tone is turned on. This is a tone that sounds each time an SpO_2 pulse is detected. It is a variable-pitch tone that changes as the patient's saturation level changes.

Touch **[SpO2 Tone]** or its associated selection field until the desired setting is displayed:

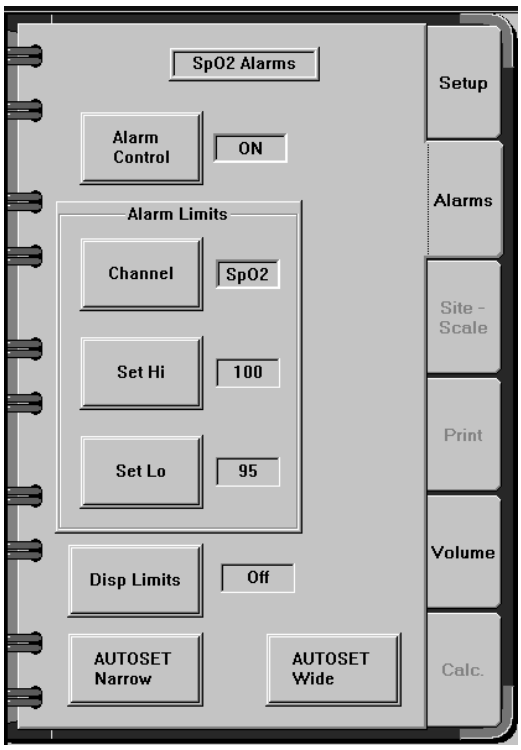
- On - activates the tone–using this option automatically turns the QRS tone off.
- Off - deactivates the tone

It is possible to turn the pulse tone off by selecting on for this option and setting the SpO_2 pulse tone volume to the minimum setting.

SpO_2 Alarms Tab

Touch the Alarms tab in the SpO_2 notebook to display the alarms options:

Figure 8-5. SpO_2 Alarms Page



Alarm Control

Use this option to turn the SpO_2 alarm notification system on or off. The default SpO_2 alarm state at power-up is Stby.

Touch **[Alarm Control]** or its associated selection field until the desired setting is displayed:

- On - turns the SpO_2 alarm notification system on
- Off - turns the SpO_2 alarm notification system off
- Stby (standby) - suspends the SpO_2 alarm notification system until valid SpO_2 data is received, then the system is automatically turned on

Alarm Limits-Channel

Use this option to specify the channel for making high and low limit alarm adjustments.

Touch **[Channel]** or its associated selection field until the desired channel-SpO2 or Pulse-is displayed.

After the channel is selected, high and low alarm limits can be set for that channel. The settings for each channel are independent and do not affect settings for the other channel.

Alarm Limits-Set Hi

This option sets the high alarm limits for SpO_2 or pulse. The range of available settings is 1 to 100% for SpO_2 and 41 to 235 bpm for pulse. The lowest possible setting must be one higher than the low alarm setting. The default setting is 100% for SpO_2 and 150 bpm for pulse.

1. Touch **[Set Hi]** or its associated selection field to activate the slider bar.
2. Move the slider control until the desired setting is displayed next to the **[Set Hi]** button.
    - Use the fine adjustment to change the setting by 1% or bpm.
    - Use the coarse adjustment to change the setting by 10% or bpm.

Alarm Limits-Set Lo

This option sets the low alarm limits for SpO_2 or pulse. The range of available settings is 0 to 99% for SpO_2 and 40 to 234 bpm for pulse. The highest possible setting must be one lower than the high alarm setting. The default setting is 90% for SpO_2 and 50 bpm for pulse.

1. Touch **[Set Lo]** or its associated selection field to activate the slider bar.
2. Move the slider control until the desired setting is displayed next to the **[Set Lo]** button.
    - Use the fine adjustment to change the setting by 1% or bpm.
    - Use the coarse adjustment to change the setting by 10% or bpm.

Disp Limits

Touch **[Disp Limits]** or its associated selection field to toggle the display of alarm limits in the SpO_2 parameter box ON or OFF.

AUTOSET Narrow

This option sets alarm limits to +/- 3% of the current SpO_2 reading within the 0 to 100% range and +/- 10 bpm of the current pulse reading within the 40 to 235 bpm range. When the autoset limit falls below the minimum setting, the lowest possible setting within the range is automatically selected. When the autoset limit exceeds the maximum setting, the highest possible setting within the range is automatically selected.

Touch **[AUTOSET Narrow]**. The setting is automatic. The new range values appear next to the **[Set Hi]** and **[Set Lo]** buttons.

AUTOSET Wide

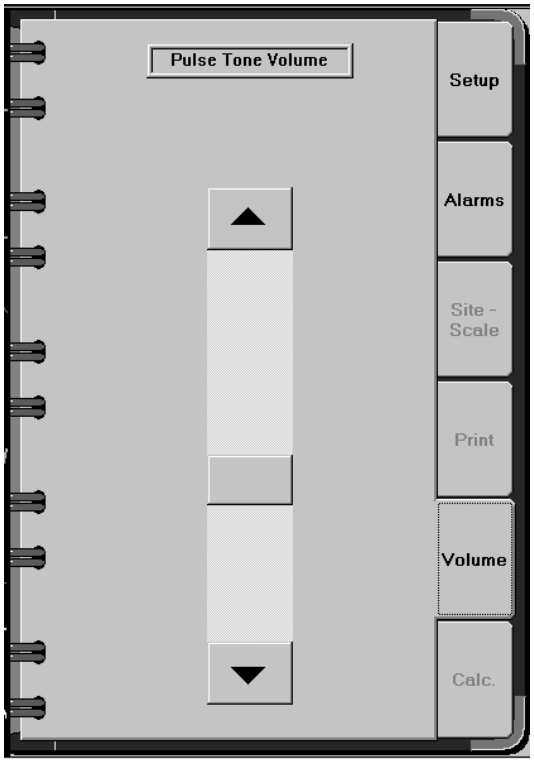
This option sets alarm limits to +/- 5% of the current SpO_2 reading within the 0 to 100% range and +/- 20 bpm of the current pulse reading within the 40 to 235 bpm range. When the autoset limit falls below the minimum setting, the lowest possible setting within the range is automatically selected. When the autoset limit exceeds the maximum setting, the highest possible setting within the range is automatically selected.

Touch **[AUTOSET Wide]**. The setting is automatic. The new range values appear next to the **[Set Hi]** and **[Set Lo]** buttons.

Volume Tab

Touch the Volume tab in the SpO_2 notebook to display the Volume page:

Figure 8-6. SpO_2 (Pulse Tone) Volume Page



Setting the Pulse Tone Volume

Use this option to adjust the volume of the tone that is sounded for each SpO_2 pulse beat.

Move the slider control to adjust the volume. The volume is turned off when the slider control is at the bottom of the slider. The volume is set to maximum when the slider control is at the top.

Summary of SpO_2 Alarms

This section contains all warning, caution, and advisory alarms associated with SpO_2 monitoring.

NOTE: This summary assumes that the patient's condition is checked before attempting to change any system settings when patient condition alarms occur.

Table 8-1. SpO_2 Warnings

Message	Condition	Suggested Action
NO OXI PULSE	No pulse detected	Check the patient. Check the sensor placement.
SPO2 LOW	The reading is lower than the alarm limit setting	If the alarm setting is incorrect, reset the low alarm limit.
OXI PULSE LOW	The pulse rate is lower than the alarm limit setting	If the alarm setting is incorrect, reset the low alarm setting.

Table 8-2. SpO_2 Cautions

Message	Condition	Suggested Action
SPO2 HIGH	The reading exceeds the alarm limit setting	If the alarm setting is incorrect, reset the high alarm limit.
OXI PULSE HIGH	The pulse rate is higher than the alarm limit setting	If the alarm setting is incorrect, reset the high alarm setting.

Table 8-3. SpO_2 Advisories

Message	Condition	Suggested Action
SRVC CV MON	Internal system fault	Contact an authorized representative of DrägerService
SPO2 SENS ERR	Sensor failure	Ensure good sensor connections or replace sensor. If failure continues, contact an authorized representative of DrägerService.

Problem Resolution

Inaccurate SpO_2 results:

- Too much ambient light on the sensor. Cover the sensor with opaque material.
- Long or acrylic fingernails and nail polish can affect readings.
- Patients with Sickle Cell Anemia, anemia, or jaundice may have inaccurate readings.

No pulse tone:

- SpO_2 tone is on, but the SpO_2 probe is not connected. Turn SpO_2 tone to Off.
- SpO_2 pulse tone volume is at minimum setting. Increase volume using slider control on the Volume page of the SpO_2 setup notebook.
- Long or acrylic fingernails and nail polish can affect readings.
- Patients with Sickle Cell Anemia, anemia, or jaundice may have inaccurate readings.
- Smokers have a higher CO blood level affecting the carboxyhemoglobin count.
- Some antibiotics can cause increased levels of methemoglobin, which produces a result of reduced hemoglobin, resulting in a low SpO_2 reading.

9

Specifications

This section describes the specifications for the Integrated Patient Monitor Option.

General

Dimensions (W x H x D) . . . . . .4 x 7 x 14 inches
Weight (approximate) . . . . . .8 lbs

Environmental

Storage

Temperature . . . . . .-10–50°C
Humidity . . . . . .10–95% relative humidity (noncondensing)

Operating

Temperature . . . . . 15–35°C
Humidity . . . . . .40–70% relative humidity (noncondensing)

NOTE: Operating specifications are for an Integrated Patient Monitor mounted within a Narkomed 6000. The conditions refer to conditions external to the Narkomed 6000.

Electrical

Equipment class . . . . . .IEC 601-2-27 Class 1, Type CF

ECG Monitoring

Acquisition of up to 5 electrode ECG . . . . . I, II, III, aVR, AVL, aVF, V
Lead fail. . . . . .identifies failed electrode and posts alarm
Waveform display aspect ratio . . . . . 0.40 sec/mV (amplitude = 10 mm/mV, length = 25 mm/sec)

Heart rate:

- Heart rate averaging . . . . . 8 beats
- Display update interval . . . . . .2 seconds
- Response time to heart rate change. . . . . <6 seconds (per AAMI EC13)
- Time to alarm for tachycardia . . . . . .< 10 seconds
- Limit alarm delay . . . <13 seconds after limit alarm condition exceeded
- Heart rate detection . . . . . .30 to 300 bpm
- Measurement accuracy . . . . . .±5%

QRS detection . . . . . ±0.5 to ±5.0 mV and 40 msec to 120 msec Q to S duration
Bandwidth . . . . . .0.05 Hz to 25 Hz
Common mode rejection . . . . . 90 dB minimum at 60 Hz
Tall T-wave rejection. . . . . 100% of aR at QRS detection of 100 msec

Pacemaker detection/rejection:

Input voltage range. . . . . ±2 mV to ±700 mV
Input pulse width . . . . . 0.1 ms to 2 ms
Rise time . . . . . 10 µs to 100 µs
Over/under shoot. . . . . 2 mV (max)
Baseline drift. . . . . <0.5 V with ±700 mV, 2 ms pacemaker pulse applied
Defibrillator sync output pulse . . . . . 5V ±20% amplitude and 10 msec ±20% pulse width
Protection against electric shock . . . . . type CF (defibrillator-proof)

Invasive Blood Pressure Monitoring

Input measurement range (after autozero). . . . . -98 to 350 mmHg
Zero balance range . . . . . ±150 mmHg
Zero balance accuracy. . . . . ±1 mmHg
Measurement accuracy. . . . . greater of ±1 mmHg or 2%
Protection against electric shock . . . . . type CF (defibrillator-proof)

Cardiac Output Monitoring

Output range. . . . . .0.2 to 15.0 liters/min.
Blood temperature range . . . . . .30°C to 42°C
Injectate temperature range . . . . . .-0.3°C to 30°C
Waveform frequency response . . . . . 0 to 10 Hz
Protection against electric shock . . . . . type CF (defibrillator-proof)

Temperature Monitoring

Input temperature . . . . . 0°C to 45.1°C
Probe compatibility. . . . . YSI 400 or YSI 700
Maximum time to accurate measurement. . . . . ≤45 sec.
Accuracy . . . . . ±0.1°C for YSI 400 ±0.3°C for YSI 700
Resolution . . . . . 0.1°C
Protection against electric shock . . . . . type CF (defibrillator-proof)

Noninvasive Blood Pressure Monitoring

	Blood pressure measurement range	15 to 275 mmHg
	Blood pressure resolution	1 mmHg
	Protection against electric shock	type BF (defibrillator-proof)
Cuff Inflation	Maximum inflation pressure	150 mmHg Neonatal 300 mmHg Adult/Pediatric
	Typical sample duration	20 to 40 seconds
	Stat mode duration	5 minutes

Pulse Oximetry Monitoring

	SpO_2 saturation range	0 to 100%
	Pulse rate range	40 to 235 bpm
	Accuracy- SpO_2	±1.5% for 90 to 100% saturation ±2.1% for 80 to 89.9% saturation ±2.4% overall for 60 to 100% saturation
	Accuracy - pulse rate	±1.7% at a constant pulse rate
	Alarm limit ranges	1% to 100% for SpO_2 40 to 235 bpm for pulse rate
	Displayed frequency	1.5 Hz to 10.5 Hz
	Protection against electric shock	type BF (defibrillator-proof)

A-1

Spare and Replacement Parts

This section lists the spare and replacement parts for the Integrated Patient Monitor along with their part numbers.

Description	Part Number

Manuals

Integrated Patient Monitor Option Operator's Instruction Manual (this manual)	4116574
Narkomed 6000 Binder and Instruction Manual Assembly (includes Integrated Patient Monitor Option Operator's Manual)	4112817-012

ECG Monitoring Accessories

5-lead ECG cable with ESU filter for OR use (AHA colors)	4113273
Leadwire set, AHA, individual 5-lead w/grabbers (mixed length)	4113274
5-lead ECG cable with ESU filter for OR use (IEC colors)	4113397
Leadwire set, IEC, individual 5-lead w/grabbers (mixed length)	4113455
Leadwire set, AHA, snaps	4113456
Leadwire set, IEC, snaps	4113398
Leadwire set, AHA, individual 3-lead w/grabbers, 51 in.	4116966
Leadwire set, IEC, individual 3-lead w/grabbers, 51 in.	4117179
3-lead ECG cable, neonatal (AHA colors)	4116967
3-lead ECG cable, neonatal (IEC colors)	4117181
Leadwire set, AHA, neonatal 3-lead	4116968
Leadwire set, IEC, neonatal 3-lead	4117182

Invasive Blood Pressure Monitoring Accessories

BP adapter cable for Baxter-Edwards transducer	4113275
BP adapter cable for Ohmeda/Spectramed transducer	4113276
BP adapter cable for Utah transducer	4113277

Cardiac Output Monitoring Accessories

Cardiac output cable, 12 feet	4113261
Bath probe sensor, 6 feet	4113262
In-line CritiKit Ohmeda/Spectramed temp. probe, 3 feet	4113263
In-line CO-set Baxter temp. probe, 3 feet	4113264
In-line Abbott Thermoset temp. probe, 3 feet	4113265

Temperature Monitoring Accessories

Temperature cable for disposable probes (400 series). 4112937
Disposable rectal/esophageal temp. probe, 12 fr (400 series). 4112938
Box of 100 disposable probes (400 series) 4112938-001
Temperature probes YSI series 700 (2) 4107800

Noninvasive Blood Pressure Monitoring Accessories

NIBP tubing, 12 feet, adult 4113454
NIBP tubing, 8 feet, neonatal 4113454-001
Newborn reusable cuff, gray, 6-11 cm 4113395-001
Infant reusable cuff, tan, 10-19 cm 4113395-002
Child reusable cuff, green, 18-26 cm 4113395-003
Adult reusable cuff, blue, 25-35 cm 4113395-004
Large adult reusable cuff, red, 33-47. 4113395-005
Thigh reusable cuff, brown, 46-66 cm 4113395-006
Newborn reusable cuff, gray, 6-11 cm, non-latex 4113395-007
Infant reusable cuff, tan, 10-19 cm, non-latex 4113395-008
Child reusable cuff, green, 18-26 cm, non-latex 4113395-009
Adult reusable cuff, blue, 25-35 cm, non-latex 4113395-010
Large adult reusable cuff, red, 33-47, non-latex 4113395-011
Thigh reusable cuff, brown, 46-66 cm, non-latex 4113395-012

SpO_2 Monitoring Accessories

SpO_2 interface cable, 10 feet 4113453
Finger Sensor 4113823
Durasensor 4108983
Oxisensor D-25, adult. 4108984
Oxisensor D-20, child 4108985
Oxisensor D-15, adult nasal. 4108986
Oxisensor N-25, neonate. 4108987
Oxisensor I-20, infant. 4108988

Miscellaneous

Cable, defib sync, unterminated 4113460
Integrated Patient Monitor Module. 4113465-001

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Template Tables

This section provides tables of settings that can stored in a template as well as the factory default values for those settings.

Factory Default Settings

The following tables contains factory default values for various parameters and machine settings. For Narkomed 6000 machines that *do not* have the Templates and Sounds option installed, these tables specify the values that will be set automatically at power-up.

For Narkomed 6000 machines that *do* have the Templates and Sounds option installed, the tables below contain the values stored in the Factory template (exceptions are noted). They also specify the parameters and settings that can be stored within a Site or user-created template (with the noted exceptions). The specific values for those parameters and settings are determined by the clinician. The values that are invoked automatically at power-up are stored in the Site template.

Parameter	Alarm Limit (High)	Alarm Limit (Low)	Site or Units	Waveform Scale	Limits Display	Units Display	Other
Oxygen	100	30			Off	Off	
CO_2 Expiratory Inspiratory Cal Delay Period Sample Flow	 50 4	8	mmHg	53 mmHg	Off	Off	 5 minutes Maximum
Breathing Pressure Peak PEEP Apnea Threshold Plateau Display Mean Display	 50 6				Off	Off	 12 cmH_2O Off On
Minute Volume		1.0			Off	Off	
Agent Halothane Isoflurane Enflurane Desflurane Sevoflurane N_2O	 3.0 3.0 3.0 9.0 6.0	 0.0 0.0 0.0 0.0 0.0		10% 50%	Off	Off	Note: the agent scale changes to 20% for Desflurane
Heart Rate (ECG) Channel 1 Channel 2 Pace Pulse QRS Tone QRS Volume	150	50	 Lead II Lead V	 1x 1x	Off	Off	 Off Off 50%

Parameter	Alarm Limit (High)	Alarm Limit (Low)	Site or Units	Waveform Scale	Limits Display	Units Display	Other
IBP Channel 1 Systolic Mean Diastolic Cursor	 300 300 300	 -30 -30 -30	ART	180 mmHg	Off	Off	 Off
IBP Channel 2 Mean Cursor	 300	 -30	CVP	30 mmHg	Off	Off	 Off
IBP Channel 3 Systolic Mean Diastolic Cursor	 300 300 300	 -30 -30 -30	PA	40 mmHg	Off	Off	 Off
IBP Channel 4 Systolic Mean Diastolic Cursor	 300 300 300	 -30 -30 -30	FEM	180 mmHg	Off	Off	 Off
SPO_2 Saturation Pulse SPO2 Tone Tone Volume NIBP Interlock	 100 150	 90 50			Off	Off	 On 40% On
Cardiac Output Blood Temp. Catheter Size Injectate Type Catheter Type Injectate Probe	 40.0	 30.0			Off	Off	 7.5 10 cc Baxter Inline
Temperature T1 T2 T1 - T2 T1 - T2 Display	 42 42 5	 30 30 -5	°C ESO SKIN		Off	Off	 Off
NIBP Systolic Mean Diastolic Interval CompleteToneVol Patient Age	 300 300 300	 0 0 0	 Adult		Off	Off	 5 minutes 20%

System Settings	Value	Notes
Trace Speed CV Respiratory Waveform	 25 mm/sec 12.5 mm/sec	
Alarm Volume	Minimum	
Countdown Timer Interval Enabled AutoCycle Audio Notify	 5 minutes Off Off Off	The Countdown Timer settings cannot be stored within a template. The settings listed here will be restored with each machine power-up or template invocation.
Elapsed Timer Enabled	 Off	The Elapsed Timer settings cannot be stored within a template. The settings listed here will be restored with each machine power-up or template invocation.
Pressure Gauge Threshold Enable Audio	 20 cmH_2O Off	The Pressure Gauge settings cannot be stored within a template. The settings listed here will be restored with each machine power-up or template invocation.
Data Log Interval NIBP Cardiac Output Warning Caution *Position	 1 minute Off Off Off Off Horizontal	 *Position setting available with Templates and Sounds option only
Numeric Box Position Lock Volume Agent	 Off Off	
Waveform Print *IPM Installed* Waveform #1 Waveform #2 *IPM Not Installed* Waveform #1 Waveform #2	 ECG II ECG V Pressure None	The Waveform Print settings cannot be stored within a template. The settings listed here will be restored with each machine power-up or by exiting Monitor Standby via **[New Case]**.
Vent Confirm Tone	On	
MAC Display	Off	
NIBP Pulse Display	Off	

System Settings	Value	Notes
*Ventilation Sound Selection Volume	 None 50%	*available with Templates and Sounds option only
N_2O Waveform Display	Off	
Screen Configuration Mode IPM Installed IPM Not Installed	 Automatic Respiratory Only	

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